THE

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ELECTRICAL REVIEW.

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MUNICIPAL TRADING AMENITIES.

WHERE the same Corporation possesses both gas and electricity supply departments, a certain amount of rivalry and competition between the respective Committees is inevitable and, within limits, salutary, for there is no spur so keen as that of competition. The Gas Committee of the Manchester Corporation, however, has for some time past shown signs of growing restive under the pressure placed upon it by the Electricity Committee; the chairman of the former has even said that the gas department was being "slowly murdered" by the electricity department; and last month, unable longer to endure this lingering torture, he unburdened his feelings at a joint sitting of the two Committees, under the presidency of the Lord Mayor.

A summary of his eloquent indictment of the rival Committee's practices, and the detailed reply of the Electricity Committee, is given elsewhere in this issue; it is well worth reading, as shedding a most interesting light upon the problems and conditions of municipal trading in the greatest industrial centre of this country. From our point of view—which, we admit, cannot be regarded as free from bias—the reply of the Electricity Committee appears to afford a complete and ample vindication of the policy which it has pursued, and even to turn the tables upon the Gas Committee to some extent, for it is clearly shown that the latter monopolises the street lighting of the city, and practically dictates its own terms for that profitable supply.

The error of the chairman of the Gas Committee (who, for a few years, was chairman of the Electricity Committee in its early days) in comparing the prices charged to power users with the average cost of production for all purposes, is inexcusable in one of his position and experience. It is an error of which we have grown weary, cropping up, as it does, in one quarter after another. It is no new cry at Manchester, and the frequency with which it has been exposed ought to have ensured its permanent suppression. If no one should be charged less than the average price, it obviously follows that no one can possibly be charged more than the average, and as the Electricity Committee points out, on this basis every supply undertaking in the country is grossly overcharging its lighting consumers. The error needs but to be named to be recognised at once, and the Committee even quotes one of our gas contemporaries as admitting the principle in connection with electricity supply, that the cost depends upon the nature of the load.

To deal with all the various points raised would require more space than we can afford to devote to this subject; but there are certain features contained in the reports which we cannot pass over without comment.

First, as regards depreciation; some years ago we earned for ourselves an unmerited reputation for hostility to municipal enterprise by maintaining that the redemption of debt was not an adequate provision for depreciation, and that additional provision must be made, to allow for the early "death" or obsolescence of plant before the period of the loan had expired. We have never swerved from this opinion, in spite of all opposition, and we have been gratified to see it not only justified by actual experience in the course of years, but

freely accepted and endorsed by practically all parties. The principle is emphasised both by the chairman of the Gas Committee and by the Electricity Committee in the course of the discussion under notice.

We have also demurred repeatedly to the payment of large sums towards the reduction of rates by undertakings whose financial stability was far from assured, and was even endangered by these payments. Until depreciation has been adequately provided for, and a substantial sum set aside to provide against renewals and contingencies, it is manifestly wrong to claim from a trading undertaking any sum by way of dividend or bonus to the rates. Here arises also the wider question whether, in any event, a trading enterprise conducted by a public authority ought to make a profit, or whether any surplus should not rather be utilised for the purpose, first, of strengthening the stability of the undertaking, and secondly, reducing the prices charged to consumers. This is a question of a highly debateable character; strong arguments can be adduced on either side, and undoubtedly the practice of municipalities varies widely. Even the State is inconsistent in this respect, for the surplus revenues of the Postal Service are jealously guarded by the Exchequer, although the telegraph service is given at less than cost price, and apparently every effort will be made by public bodies this year to ensure that the telephones shall also show a deficit. On the other hand, the Parliamentary Committees cited by the officials of the Manchester Corporation have made it clear that they will not countenance a profit exceeding 1 per cent. on the outstanding mortgage debt of municipal trading undertakings, and that they are, in fact, opposed to the principle of making a profit for the benefit of the rates. This ruling, while it is not retrospective, and therefore does not affect existing undertakings, nevertheless embodies a principle of fundamental importance which should be brought home to every trading municipality in the kingdom. It is a matter which should not be left to the choice of the local municipal authorities, who are bound to be swayed more or less by political, personal and other considerations external to the merits of the question. The general adoption of the principle should also be productive of great benefit to the undertakings concerned, which, when no longer subjected to the continuous drain upon their resources, will be enabled to achieve greater efficiency and financial stability, and to supply the public needs at the minimum prices. This in the long run will advantage even those who complain of rate-aided competition, forgetting that, so long as such an undertaking receives no subsidy directly or indirectly from the rates, it has to provide for the payment of interest and sinking fund as well out of its revenues, and therefore is in no better position than a private undertaking paying a fair dividend to its shareholders.

Another point that has arrested our attention is the claim made by the Electricity Committee that as the plant put down for the power users cost less than the plant previously installed, the new consumers (*i.e.*, the power users) were entitled to the benefit of the reduced capital charges. A similar contention, we believe, was put forward by the West Ham Council under similar circumstances. In the case of such a consumer as an electric tramway, which, if it had had a generating station of its own, must necessarily have been precluded from benefiting by the low prices attained since its plant was installed, this argument, no doubt, holds good; but what distinction can be drawn between the various lighting consumers? Those who come on the mains after the cheap plant is installed have as good a right as the power users to the benefit of the lower capital charges, but they cannot be preferred before the older lighting consumers, who, moreover, may fairly claim to have been the mainstay of the undertaking in its early days. It would appear, therefore, that the whole of the lighting consumers are entitled to a share in the reduction of capital charges.

Fortunately, the situation has been so modified by the perfecting of the tungsten lamp, that this question has become of academical interest only; for the new lamps of themselves have reduced the accounts of lighting consumers to a far greater extent than could ever have resulted from a reduction in the capital charges of the undertaking, and far greater than the supply authorities can contemplate with equanimity.

Public Time.

In an article in *Nature* of February 16th the work of the British Science Guild Committee on the synchronisation of public clocks is discussed. The Committee approached the L.C.C., the City Corporation, H.M. Office of Works, the L.G.B., the Post Office, and the various railway companies, but the response was very discouraging; the Post Office authorities alone appear to realise the immense importance of the matter. The Committee states that "Big Ben," which automatically reports its time-keeping performance to Greenwich Observatory, and the large clock in the portico of the old Post Office in St. Martin's-le-Grand, which is electrically synchronised, are probably the two large public clocks in London which can best be relied upon to indicate Greenwich time.

Recently public clocks have been installed by the local authorities in Aberdeen and Sheffield, and others are about to be erected in Liverpool and Taunton, which will all be electrically synchronised with Greenwich time. The makers of electric clocks also arrange for their master clocks to be synchronised. The importance of correct time appears to be more fully appreciated abroad than it is here; but progress has been made, though slowly, and eventually, we hope, this country will awaken to the value of "the right time."

The extraordinary views of many people, who, no doubt, have not troubled to investigate the matter and to make themselves acquainted with the facts, are well exemplified by the support given to the Daylight Saving Bill, which it is intended to bring before Parliament again during the current session. It is difficult to comment in moderate language on this egregious proposal. Surely the British character must have sunk to a pitiable degree of weakness if, as Lord Justice Moulton remarked at the I.E.E. dinner, an Englishman cannot get up at six o'clock unless he is told it is seven! The adoption of the Bill would give rise to chaos where there is already more than sufficient confusion, and would make us the laughing-stock of the world. Our French friends, who have just agreed to adopt Greenwich mean time, are puzzled to know how and when to introduce the modest change of 10 minutes or so that will be necessary; yet some of us propose to advance and retard the movement of our mighty and infinitely complicated organisation by a whole hour, twice a year, with a degree of irresponsibility and thoughtlessness that is perfectly astounding.

There is one consolation—the chances are all against the possibility of the Bill becoming an Act, in view of the congestion of Parliamentary business.

On Going Abroad.

The speeches of chairmen of companies are always interesting at this time of the year. Of special note in a particular connection is that of Mr. Andrews to the Bruce Peebles shareholders, which we report elsewhere in this issue. It was always understood that this company prior to its reconstruction had made large efforts at building up a foreign connection, but the unfortunate collapse which everybody will remember acted, of course, for a time as a powerful brake on the wheels of progress. Now, happily, the new directorate and management are beginning to find some relief from the oppressive financial and engineering incubus which came to them as a most undesirable legacy, and the uphill fight is being carried on with increasing hopes of ultimate success. The company is to be congratulated upon having at last obtained "a clean sheet," so that it can, unhampered by burdens from bygone days, devote itself exclusively to progressive enterprise both in manufacturing and selling. Reorganisation of finances, of manufacturing designs, of staff and of business-getting operations, all are expected to conduce to a larger turnover with a more economical cost of production. The volume of business available in the home market is found to be increasing, but the works are not occupied to their full capacity. At home, insensate price-cutting between rival manufacturers has not ceased. Abroad, a

strong policy of expansion has been adopted which is bearing excellent fruit. What the company has been doing through its travelling representatives in Canada, Australia, New Zealand and South Africa, and through its agencies in all of these countries; the appointment of a special permanent engineer representative at Johannesburg; the resident engineer appointment for India; the attention to China—all these things are well worthy of note. They have been costing an appreciable amount of money as is to be expected if the effort is to succeed, but as Mr. Andrews indicated, to refrain from spending money thus in times like the present would be a false economy. If you do not go out to get work "you may rest assured it will not come to you of its own accord." This might almost have been one of our own sentences! We have a certain amount of satisfaction in reading Mr. Andrews's condemnation of the habit of those who bemoaned the lot of the engineering trade of Great Britain, and predicted an untimely end for all connected with it; also it is pleasing to see recognition of the efforts of those scribes who, like ourselves, "have not allowed themselves to regard matters in this melancholy fashion, but have kept a stout heart all through."

British Manufacturers and Continental Electrical Trade.

We have repeatedly urged British electrical manufacturers to carry the war into the enemy's camp and make a more determined effort to sell their manufactures in Continental countries. Quite recently there have come under our notice the experiences of several well-known electrical firms who have been well rewarded for so doing. And what some have done more can do, unless they pre-judge the situation because of what they have heard, or what they have found as the result of a superficial or perfunctory attempt. The man who starts out to deal with a position with the conviction that the door is closed to him, is not the most likely person to make an open way to business.

One of our English friends, who has recently been on a visit to Roumania, writes informing us that the Germans are spreading themselves there very much in electrical work; but, he adds, "they have no better chance than English firms who will ship goods by boat; Customs duties are the same for both, and prejudice is, if anything, in favour of English stuff." He speaks of an electric motor ordered from Germany last August, for quick delivery, which has not arrived yet, and regret is expressed that it was not ordered from England, seeing that it might then have been obtained long ago. "Are none of the Home firms open to do business here? They may have to carry a small stock for immediate delivery, but can be sure of selling it, if well chosen. There are big increases coming soon in electric working at the wells—for pumps and even for drilling. Every day more motors—30 to 50 H.P.—are wanted, and are being ordered from Germany." Our correspondent asks us to urge Home firms to make stronger efforts in the Roumanian market. Gladly do we pass on his advice, hoping that it will not go by unheeded.

The Telephone Service.

The interesting paper read by Mr. H. Laws Webb before the London Chamber of Commerce, of which we give an abstract in this issue, should serve to drive home the difficulties and dangers of State ownership of commercial undertakings. His pitiless exposure of the failure of the telegraph service to meet, even approximately, the anticipations which led to its acquisition—showing that the cost of the purchase had nothing to do with the annual loss on the service, for the business cannot pay any interest on any portion of the capital expended—reads ominously when we are on the eve of a still more costly and more speculative adventure in State ownership.

The only argument in favour of the transfer that appears to carry any weight, is that which, ignoring the telegraph fiasco, points to the millions of surplus revenue derived from the Postal Service as evidence of the competent and successful conduct of a great commercial undertaking; but as Mr. Webb pointed out, it would be difficult to avoid making a profit on a business which calls for no technical skill, and which, paid for by the ounce, is handled by the ton. No wonder, as he says, that he has seen postmen on duty riding in hansom cabs!

There is another consideration which we do not remember to have seen put forward, namely, that we have absolutely no standard of comparison by which to judge the performance of the postal service. Is it not possible that in the hands of private enterprise, or at any rate of an authority independent of political influence, such as that which Mr. Webb proposes for the telephone service, the postal service would be conducted with at least equal efficiency and profit, but at far less cost? As all postal services have been nationalised, it is impossible to bring evidence to that effect; but, in view of the notorious loss of efficiency and economy inherent to State ownership and management, we think there is little room for doubt, and we should welcome any solution of the telephone problem, whether on the lines suggested by Mr. Webb or otherwise, which would ensure that the civil service should not be increased by 18,000 employés—a number likely to be greatly augmented in the near future.

Copper.—The diminution in stocks does not appear to be heavy at the present time, to judge by the mid-monthly statistics issued by Messrs. Merton, the falling-off for the first fortnight in February being only 384 tons; the average decrease per month for the past 12 months was 2,500 tons. The stock in English ports has actually increased by 46 tons, the diminution being made up of withdrawals from Havre, 80 tons, and quantities afloat from Chile and Australia, less by 350 tons. The stock in Rotterdam is increased by 100 tons, and the Hamburg stock is estimated to remain the same as at the end of January. Supplies from N. America to Europe are average; from Spain and Portugal to England and France, at 2,220 tons for the half-month, distinctly high, though lower to other countries. Shipments from Chile are well up, from Australia just average. Deliveries are on the same scale as for January. The combined visible supply for January 31st is 8,508 tons higher than for the end of December, 1910, the American stocks having appreciated by the large quantity of 9,112 tons.

The National Electrical Manufacturers' Association.—The annual general meeting of this Association is to be held at the Institution of Electrical Engineers on Tuesday next, 28th inst., at 2.30 p.m. This will be the first annual general meeting held under the new articles of association. Among other business will be the election of a Council of "All British" Manufacturers, and the election of a general committee, composed of members, associate members and associates. Full members are *bonâ fide* British manufacturers; associate members are firms who import as well as manufacture; associates are agents and others of a generally similar description.

Electricity in Mines.—At a meeting of the Council of the Durham Miners' Association, on 18th inst., it was decided to ask the employers to cease working all coal-cutting machines by electric power. At the same time the Executive Committee was instructed to impress upon the Government the necessity of withdrawing the use of electric power from underground workings altogether, or of permitting its use only under the most stringent precautions.

Old Ferrantics' Dinner.—It is proposed to hold, as soon as possible, a dinner—probably at the Trocadero Restaurant, London—at which all old Ferranti men are invited to attend. Mr. S. Z. de Ferranti will be the guest of the evening. The date will be fixed later, but a small committee, which includes Mr. A. Bruce Anderson, Mr. C. P. Sparks, Mr. H. W. Kolle, Mr. Chas. Day, Mr. G. del Rivo and Mr. Gerald W. Partridge, has the arrangements in hand. It is hoped that all interested Ferrantics will make a special effort to be present; also they will assist materially if they will bring the project to the notice of all the old Ferrantics with whom they are acquainted. Communications should be addressed to the hon. sec., Mr. W. E. Warrilow, Selwyn, Mildred Avenue, Watford, and he will forward full particulars with pleasure.

Thwaite Fund.—We are requested to state that the balance of this fund having been handed over to the Public Trustee to administer under a deed of transfer accepted by him, the Committee of the fund have now been dissolved, and take this opportunity of returning their sincere thanks to all who so kindly subscribed to the fund.

ELECTRICITY A PUBLIC BENEFACTOR.

By PERCY GOOD, A.C.G.I.

During the past few months an active campaign has been started against the dreaded and yet preventible disease, consumption. The importance of this and the need of the active support of everyone have been well shown by Mr. Hall Caine in recent articles in the *Daily Telegraph*. It is impossible, without unduly trespassing on the space of a technical journal (and also without the ability of the famous writer), to bring home fully the astonishing facts in connection with this disease. Put briefly, 90,000 persons die of it annually in the United Kingdom. This means that in London alone 15,000 persons die every 12 months.

This represents a huge financial loss as well as a social menace, as a large proportion of these persons are in their prime. The monetary loss cannot be less than eight millions sterling per annum, and is probably much greater.

The chief cure for this disease is fresh air. To obtain this every effort should be made; without a doubt the development of the electric tramway is a great factor in the well-being of the community, and the sums spent on it are as a mere nothing compared with the benefits it brings. The extension of the system in every direction should be urged by the public on every possible occasion, particularly when the road leads to the country. It is inconceivable that any other form of road traction could possibly have done the same work. That this is so could be realised easily if a visit were made to such a crossing as the Elephant and Castle at 6 p.m., reflecting at the same time that to replace each tramcar two petrol omnibuses would be necessary. It would be impossible to breathe if the change were made. It is doubtful if anyone could even see across the street, and the road would be too oily to cross. Municipalisation may be objected to, but the electric tramway deserves the support of every thinking person.

On considering the question of lighting and heating by electricity, the slowness with which this is being adopted makes one wonder for the sanity of the Londoner, past and present.

The amount of gas made in London in one year amounts to a total of about 50,000,000,000 cb. ft., a truly colossal amount. Every one of these requires over 8 cb. ft. of air for its combustion. The air required is, therefore, about 450,000,000,000 cb. ft.—over three times as much as the whole of the people want. This is equivalent to packing over three times as many people into the space—and, recollect, it is mostly used in the poorer and already overcrowded portions.

To realise what this really means, it is necessary to take some actual case. A small room, 12 ft. × 12 ft., is commonly the home of four persons. Picture the room with 12 in it, and you have some idea of the unwholesomeness of London due to gas burners.

Our councillors and charitable persons plead for open spaces and call them "lungs" for Londoners. Do they realise that the amount of air used daily in London by the gas would cover four square miles to a depth of 10 ft.?

It would probably be cheaper and more beneficial to wire all houses free of charge, and supply electricity at cost price. This may sound impracticable, but it must be remembered that the gas burns near the people's mouths, and it is insatiable for air. It is well known what happens to the gas if it does not get its proper air supply—it pops and goes out. Those 15,000 persons go out every year for want of air.

The big gas companies pay almost, if not quite, the whole of their dividend out of by-products. Let the public purse be used to shift them nearer to the sea coast, and let them there make their by-products, but insist on the suppression of the sale, as an innocuous commodity, of this insidious poison. Other poisons have to be supplied in specially shaped bottles, or, at all events, properly labelled; why not this stuff?

We spend large sums on the removal of sewage, and rigorous precautions are insisted upon to prevent the foul gases therefrom reaching the public throat, yet a grandmotherly legislation has done all in its power to suppress the use of electricity, which is the only proper and healthy artificial light, and ought to be made compulsory in densely populated districts.

Continuing the cleansing process, the use of petrol, coal, and all other of these life-consuming commodities would be suppressed in densely-populated areas, and the demand for electricity would be such as to bring Mr. Ferranti's scheme of generation at the pit's mouth, and electrical energy at ½d. or less per unit, into being at once.

Any prospective user of electric light should be asked to think. It is no stretch of the imagination to say that he is doing the public more good by using electricity instead of gas, than if he paid the value of his whole electricity bill to the hospital fund.

It is not suggested that any injury should be done to existing interests, but it appears to be high time that the electrician considered his business seriously in the same way as a medical man is expected to consider his profession, and worked it on other lines than mere cost.

It is time that public bodies should cease to trouble us with rules and regulations, all of which raise the price of this needed commodity. The rates should be freely drawn upon to provide the necessary installations in all poorer and crowded districts, as the money would really be out earning a large return, in the saving of the lives of the workers.

COPPER PRODUCTION DURING 1910.

This interesting and important subject is treated in three comprehensive articles published in the *Mining World* for January 21st. The writers deal with the world's copper production for 1910, particularly the United States output for that year, and the probable tendency of prices, deduced from former statistics. As the largest producer, the United States naturally comes first in considering output, and the writer (Mr. H. J. Stevens) notes in this connection that, although in 1880 the United States supplied only 17 per cent. of the world's copper output, the proportion rose to 50 per cent. in 1895, and for the past 15 years the United States has furnished 53 to 57 per cent. of the total copper production of the globe, and there seems no immediate prospect of any particular change in this percentage. The Lake Superior district in 1910 furnished about 100,459 tons of finished copper, or practically the same as for the two preceding years. Several of the developing mines of this district are in a position to increase production materially within the next two years, and the older mines, almost without exception, could make a somewhat larger production than has been secured since 1907. With a good demand for copper at a somewhat higher price than the present level the Lake Superior mines are in a position to produce a maximum output of about 111,607 tons, but no such production will be secured in 1911, as the tendency is towards working under a slight check until the copper surplus has been absorbed fully.

In the following States production during 1910 was small:—Tennessee, Vermont, Virginia, North Carolina, Idaho, Oregon, Washington, Wyoming and Colorado. In Montana, which turned out 126,000 tons of blister and Lake copper, the important mines, with the exception of North Butte, have amalgamated as the Anaconda Copper Mining Co. Utah, with 56,000 tons, has shown a fine gain in production during 1910. Nevada (21,000) kept well up to its output, and is expected to expand. California (14,000), at present not in the first rank, has promising mines developing. Arizona (130,000 tons) remains the largest producer of the Union. There is every prospect that the combination of the Calumet and Arizona, and the Superior and Pittsburg properties will be effected. In New Mexico (28,000) there are large deposits which are by no means worked up to their capacity. The Chino Mine, in Grant County, is an interesting instance of the development of a property containing low-grade ore. Colorado (36,000) produces copper only as a side issue to gold and silver mines. Oklahoma has some minor development works in progress. In Alaska

(25,000) several rich companies have properties, and development is expected. The Copper River Railway is extending, and should reach Bonanza Mine in time for considerable shipments of ore in 1911.

Canadian mines, principally in the boundary district of British Columbia, show no particular prospect of increase for 1911.

Mexico has three important mines, the most prominent of which, the Montezuma, has not yet reached its maximum output.

In South America Chile remains the largest producer, and is expected to increase. Peru, that neglected province, is principally worked by the American company owning the Cerro de Pasco, which increased its production in 1910 by more than one-fourth, the estimated output being 27,850 tons, English, of fine copper. England is said to be doing something in Bolivia, and production should improve. Argentina and Brazil have large copper deposits, but remain small producers. Copper ores exist in all the South American countries except the Guianas.

In British South Africa, the Cape and Namaqua companies remain steady producers. A sound mine, the Otavi, is worked in German territory, but the Belgian Congo is not doing anything of importance.

In Europe the Rio Tinto (Spain) is the leading mine, with a steady production. The Sulitelma (Norway) is increasing in importance. Germany has one large mine, the Mansfeld, and a number of small ones. Russian production is increasing, and prospects here are good, judicious encouragement being given by the Government.

In Asia, Turkey has good deposits, which are barely worked. China is expected to open fresh mines. Japan is coming on well, and has four strong mining companies.

In Australia the Mount Lyell, of Tasmania, the Wallaroo and Moonta, of Southern Australia, and the Mount Morgan, of Queensland, remain the largest producers, with the Great Cobar, of New South Wales, as fourth.

The total world's output for 1910 is estimated at 850,000 tons English, an increase of 13 per cent. on the preceding year. In the 12 years between 1886 and 1898 production practically doubled, and it again doubled in the 12 years between 1898 and 1910.

American mines produced approximately 647,300 tons of fine copper, refining nearly one-third more, the surplus being imported, according to the article, mines even in Africa and Australia sending their ore to the States for refining. The surplus or "visible supply" accumulated in 1910 at one time reached 200,000 tons, the equivalent of three months' supply. A certain amount of restriction was, by agreement, put on the output, which, however, is only just beginning to be apparent.

The combines effected during the year, though important, have not reached the dimensions at one time anticipated. The Guggenheim combine included the Nevada consolidated and Utah copper companies, and the Amalgamated Copper Co. merged all its Butte holdings in the Anaconda Copper Co. The Calumet and Hecla will probably merge all its Lake Superior subsidiaries in 1911. The writer does not anticipate a further combination of mining interests, but looks for the establishment of one selling agency for American producers.

A table is given of the world's production of copper since 1880. The advance has been fairly steady. The United States proportion of the production, which was 58 per cent. in 1906, was only 53·7 per cent. in 1909, and 55·6 in 1910.

Electrolytic copper has only varied 1 cent per pound during the year in the States (equal to about £4 13s. per ton). The high prices were in January, 13½ cents, and the lowest in June, 12¼ cents. Stocks in the States were highest on August 1st, 76,100 tons, and lowest in February. Production was highest in June (56,700 tons), and lowest in February, with 50,300. Deliveries were highest in December, at 58,700 tons (about two-thirds of which was for export), and lowest in April, 44,330 tons (two-thirds for domestic deliveries). The foreign visible supply was highest in March (English returns show under February 28th, 113,450 tons).

In the same journal is an able article by Mr. Martin E. Tew, on "Copper Prices and the Future of the Industry." Mr. Tew points out that, after the great impetus given to production by the electrical undertakings, which caused the world's output to double between 1880 and 1892, the rate of increase rose from 8 per cent. (compounded) to 10 per cent. per annum. Prices were most affected in 1873, 1893 and 1907. In 1873 copper fell from 35 cents to 21 cents in nine months. In 1907 it fell from 26¼ cents to 13¼ cents in the same period. The cost of production varies from 8½ cents in large mines to 10 or even 12 cents, and higher, in small ones.

The question is, whether the world's demand will continue to increase at the present rate, and, if so, if the new developments will keep pace with such consumption. The expansion in electrical matters continues steady, and the consumption of brass is distinctly on the increase. Consequently, it is to be expected that the present rate of consumption, at least, will be maintained. In spite of the recent opening-up of low-grade deposits, the writer anticipates that production will find a difficulty in keeping pace with the demand, and that higher prices may be anticipated within three years.

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY *cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.*

Trade Discounts.

Your contributor's letter, on page 252 of your last issue, condemning trade discounts given to private firms outside the electrical trade, has my warmest support.

The following details will show how I was placed at a disadvantage by a well-known firm of metallic lamp manufacturers. Amongst my clients I have a large firm who take several dozen metallic lamps per month. I have obtained these lamps through a wholesale electrical firm who are under an agreement as regards selling price, the agreement being handed down to me, as the invoice states "These lamps are sold conditional, that they are not resold under . . price." *This is how things should be.*

But, a few days ago, a canvasser from the lamp manufacturers called upon my customer, and offered to supply lamps at net trade terms. *Now, as things are*, I cannot buy lamps unless I agree to sell at a profit of 20 per cent., whereas the lamp canvasser can call upon my customer and sell at net trade terms.

In conclusion, I should think it would be wiser if lamp manufacturers recognised the fact that, after a lighting installation has been installed, the only source of profit to the contractor is the lamps used, and put a stop to the indiscriminate practice of canvassing for lamp orders, which causes a heavy loss of profit and is a source of annoyance to electric light contractors.

Percy Collins.

Wimbledon, *February 18th*, 1911.

I quite agree with the remarks of "S. J." as to trade terms often being given to one's customers. When I come across a case of this sort, I immediately write to Mr. L. G. Tate, secretary of the Contractors' Association, 20, Bucklersbury, E.C., who goes thoroughly into the matter.

Contractor.

Live-Steam Feed Water Heating.

As one who has manufactured and sold large numbers of live-steam feed water heaters for boilers during the last few years, which are in use in all parts of the world, I have been much interested in the articles and correspondence which have recently appeared in the technical Press arising from the published results obtained by Prof. Gibson in his researches at the University College, Dundee.

Opinion amongst engineers as to the efficacy of live-steam-temperature feed water is sharply divided, and a number of correspondents have tried to explain away Prof. Gibson's

results by stating that the increased evaporation with steam-temperature feed water is due to priming. That this is not so is proved beyond contention by the fact that where superheaters are used it is found that the superheat is higher with live-steam feed water in use than where the feed water is used from the economiser direct. If, as the said correspondents have alleged, water were carried over with the steam, there would be a drop of temperature in the superheater. Increased superheat is realised in all cases under equal conditions, and this effectively disposes of the contention that live steam heating produces wet steam.

There is another curious result which I have observed on many occasions, *i.e.*, where full steam temperature feed is used there is a decided increase in the temperature of the water from the economiser. The increase may be anything from 10° F. upwards; and this greater activity in the economiser shows that live-steam feed water has also a beneficial effect on combustion, probably due to hotter boiler surfaces being presented to the flues which allow the flames to reach further without being damped out by the otherwise cooler surfaces which obtain with lower temperature feed water.

It is a fact that in many instances years ago the application of live-steam feed heaters resulted in failure, but this was due to want of knowledge as to the conditions which must obtain in order to ensure beneficial results.

The comparatively few engineers who have had extended experience in the application of live steam heaters have no difficulty in showing continuously economical results, but they would not think of putting heaters to work under conditions such as have been named, and which have resulted in failure and disappointment. If the engineers who display such rabid hostility towards live-steam feed-water heating had more extended experience, they would know under what conditions substantial economy is obtained.

Geo. Wilkinson.

Harrogate, *February 18th*, 1911.

Electricity in Mines.

The controversy that has been raging in your "Correspondence" columns these last few weeks regarding the lot of the mining electrical engineer cannot but appeal very strongly to the intelligent reader. To such people who have specialisation in mining electrical engineering as the ultimate end in view, a cursory investigation of the conditions under which they labour can only bring discouragement. I have given the subject much careful attention these last few months, and I have come to the reluctant conclusion that the prevailing rampant dissatisfaction has chiefly been caused by colliery owners and managers.

I have myself been brought up in the South Wales anthracite district in intimate contact with colliery owners and managers, and have therefore had exceptional facilities for getting reliable information. The reasons that have brought me to the above conclusion, however, have mostly been gained by personal experience and observation. On the ground of this, I will have the temerity to assert that the vast majority of colliery electricians in South Wales are totally incompetent men, being, I say, for the most part men who were previously in charge of pumps, small steam engines, &c., in the colliery. Moreover, I would point out that the facilities for technical instruction in South Wales (I speak more particularly of West Glamorganshire) are totally inadequate, and therefore any small theoretical knowledge the present-day colliery electrician may have must have been obtained either from pocket-books—which essentially give only superficial information on everything—or from correspondence schools; and both are equally ineffective. Personally, I suggest that every respectable colliery installation should have a thoroughly trained electrical engineer in charge. I do not mean a man who has had a sound practical training only, but a man who also has a moderate theoretical qualification. I would at least raise the standard of efficiency to that of the average central-station engineer.

The consequences of this disgraceful incompetency are everywhere perfectly obvious to the trained engineer. Burnt-out machinery, burnt-out cables, earths, &c., are but a few of them. I, personally, know of more than one case where a colliery has been thrown partially idle by the gross ignorance of its electrician in charge. Doubtless many accidents might be traced to the same cause. Only a few months ago a fatal accident in a colliery near my home was conclusively proved to have been caused by the improper manipulation of the electrical apparatus whilst shot-firing. In the subsequent inquest an intelligent jury passed a rider that only competent men should be employed in colliery electrical installations.

And now I come to a most distressing and serious feature. I have carefully noticed that at inquests following electrical fatalities the juries invariably recommend that "only competent men . . . . &c." Yet, positively nothing is being done in this respect. The old order of things prevails; the autocracy of the colliery owner and manager is meekly tolerated and submitted to, the question of the lives that are thereby endangered and often sacrificed being wholly disregarded.

And the reason of it all? Believe me, Sir, it is merely a question of filthy lucre. The colliery manager, not unnaturally, accepts the cheapest labour he is offered. The obvious result is that the pick-up-as-you-go-along man mentioned by "Trician" in last week's Review gets preference over the truly competent man. Cannot the colliery owner be persuaded to see that, if more thorough consideration be given to the costs of colliery idlenesses, repairs, &c. (often necessitated, as I have before mentioned, by ignorance), the competent man is the more economical to employ?

And now as to the remedy. In this connection I am bitterly disappointed in the report just published (see last week's Electrical Review) of the Committee appointed by the Home Office to consider the special rules for the use of electricity in mines. The present rule regarding the competency of men in charge of colliery installations is honoured much more in the breach than in the observance, and the Committee agree that it is too vague. Their "revised" rule, therefore, provides that "the person appointed to supervise the electrical apparatus shall be appointed in writing, and be competent to do the work," truly a revision worthy of Solomon! We are thus left no better off than before. The colliery manager can still give the appointment to anybody at will, since anybody can *profess* (which is all our charitable Committee requires) competency.

I am convinced that our only remedy lies in rigorous legislation. And now, during the tenure of office of a humane and sympathetic Home Secretary, and along with the present Home Office inquiries and investigations into mining conditions, is a most opportune time to commence united representation. The status of the engineer in England is much below that which he holds in Germany, where he is considered on a higher plane than the doctor or lawyer. This result is due entirely to the representation of the formidable German engineering societies and institutions, and it is from here that our own institutions should take a lesson. They have the power if they only had the will. It would be but meet if our own Institution of Electrical Engineers would take the initiative in this direction. Is it too much to hope for? Or can it be that during the last few years it has become so inert and stagnant that it has forgotten the honourable purpose for which it was formed? Still, *dum spiro spero*.

D. Jenkins.

Wolverhampton, *February 20th*, 1911.

Colliery charge electricians invite their salaries to a great extent. I have known a number of cases where upwards of 60 applications have been received for a position. The successful applicant undertakes the maintenance of the plant at a fixed salary per week, and, in some cases, so much per day, plus percentage and a few days added to compensate for the overtime he may have to work. Now, the amount of overtime he will have to work depends largely on the workmanship put out.

Does "Trician" think officials of coal mining companies are going to pay for poor workmanship? No, not likely. I maintain that the amount of plant put in their charge and the salaries paid are amply sufficient for the requirements.

If charge electricians cry out after they have obtained the position, why invite it? Officials are prepared to pay, and are paying, high salaries.

"Trician" refers to the anthracite coal area of South Wales; the only danger of a "run-wild" would be when replacing broken straps that suspend the cables to the timbers, and then there are manholes for protection. The pressure used on this system never exceeds 500 volts, and the number of units consumed per day of eight hours is small compared with the units consumed in the deep steam coal measures of South Wales.

It is not for me to judge where mine managers have gleaned their knowledge from; it must not be forgotten that they are held responsible for the output of coal (a great responsibility where expenses are heavy).

In my previous letter I never said that motormen should be practical men; what I did say was that they should be able to understand any irregularities in the working of their motors. By so doing they would be able in many cases to ring up the electrician in charge before anything of a serious nature occurred, as it is evident that the electrician is not with the motorman throughout the day's run, and if "Trician" had charge of a plant where motors on an average haul 950 tons of coal per day of eight hours, he would realise that it would be to his advantage to have motormen that know the whys and wherefores of the motor.

Celt.

February 20th, 1911.

The Scarcity of Appointments.

What on earth has come over the electrical engineering trade? It must indeed have come to a parlous plight when it is practically impossible for sound, well-trained men to obtain appointments of any kind!

I have had a good technical training, and have been for some years past with one of the best-known electrical engineering firms in the whole kingdom; but, the necessity having arisen for me—through no fault of my own—to find another berth, I am finding, instead, the supreme difficulty of accomplishing this.

I think I may claim that I have had very good, all-round experience; I am capable of doing—and am ready to do—good, sound, conscientious, honest work of any sort (as my late firm would be ready to testify), yet, try as I may, I cannot hear of any sort of a billet, as nothing seems to be doing anywhere. Meanwhile, I am having to live upon my capital, a state of things which cannot continue indefinitely, for capital has a nasty knack of giving out, and there are many others in the same plight.

It is indeed a sorry outlook for those who are coming on, and who, with the ignorance which, if "bliss," is subject to bitter disillusionment, are doubtless looking forward with confident anticipation to careers of success and prosperity in this field.

It is high time that the most emphatic and solemn warnings were blazoned forth in the Press regarding the frightfully overcrowded state of this profession, in the interests of all those who are in danger of wrecking their careers by crowding into it. It is surely the most congested profession there now is, and one in which not more than 1 in 50 or so may hope to succeed. Many who are in it now would have been thankful indeed for a timely hint such as this.

I trust you will see your way to giving this the publicity which it ought to have.

Elektron.

City and Guilds Examinations in Electrical Engineering.

Now that the report of the City and Guilds Institute's Examinations in Electrical Engineering has been published, I should like to draw your readers' attention to the small number sitting for Honours, compared with the larger number sitting for the Ordinary Grade. The number sitting for Honours was a little over 50, of whom a little more than half passed, while those who passed first class could be numbered on both hands.

The writer believes that this is owing to two causes: first, that the technical institutes do not cater for students of this grade, and secondly, that in the second (or specialised) paper so few questions are set in each section (only five last year), that it cannot be said to be a fair test for an Honours student, and a pass thus becomes a mere *matter of chance*.

This is poor comfort to the diligent student who has given up many evenings to preparation.

More questions should therefore be set in the second paper, especially in the instrument and electrical apparatus (what an exhaustive title!) section and also in electrical machinery design, which last year was exceedingly stiff. It would be interesting to know how many of those who passed first class last year were evening students and *not technical teachers*.

With regard to the teachers of electrical engineering, the complaint is made that the teaching is not what it should be, but have the examiners themselves experience in teaching evening students? I fear not, from their remarks.

With regard to the qualifications of teachers much might be written, but the attention of those teachers who are at present only *provisionally* recognised is drawn to the new regulation, that now to be recognised fully they must have had practical works experience and a full first-class Honours technological certificate. The writer puts forward the following qualification, which would relieve the mind of many a teacher now provisionally recognised as regards his future; that is, that second-class Honours full technological certificate, at least two years' works experience and one year's satisfactory teaching experience, and a recommendation by a principal, be accepted as a qualification for full recognition. In all cases a candidate has, of course, to be appointed by an Educational Committee before he can be recognised. The writer commends the subject of the recognition of teachers in electrical engineering to the attention of the Association of Teachers in Technical Institutes, for it must concern many of its members.

I. E. E.

Electrical Cooking.

The central-station engineer has been urged from many quarters and for some time past to build up his day load by offering very cheap rates for heating and cooking, and I thoroughly agree that a well-spread day load is an ideal thing for central stations if it can profitably be catered for.

There is one item, however, which seems to have been rather overlooked in the many articles which have appeared in the technical Press on this subject, and that is the cost of distributing mains to carry this day load. I must here insert the remark that I am looking at this matter from the "small provincial town" point of view, where reasonable economy has to be practised in laying mains in order not to over-capitalise the undertaking. Two articles on cooking by electricity have recently appeared in the Electrical Review. The first outlined a scheme of company promotion to hire out cooking apparatus on a large scale, and proposed co-operation with the builders; the second article I refer to is in this week's issue and contains a lot of very interesting and useful memoranda. In this article the price of electricity is taken at ¾d. per unit and the figure of 3 kw. given as the demand for an oven.

A motor load does not call for very serious consideration, because, as a rule, motors are fairly well spread over the distributing area, and owing to their application, only to a comparatively small proportion of consumers, and their diverse use as to load and times of running, are not likely to seriously overload any distributor. Day load provided by such apparatus as Therol heaters would also present no difficulty, but when it is suggested that electrically-heated cooking ranges are the ideal day load, there is quite another problem to face. One point is that their hours of use are comparatively short; 30 to 60 minutes for breakfast, and 1 to 1½ hours for dinner, total, say, 3 hours per day, and in the better-class houses the latter meal would be cooked at the time of the winter evening peak.

In this town our main shopping streets are laid with ·062 × ·035 × ·062 mains, and the residential roads with ·035 × ·023 × ·035, the supply being three-wire, with 460 volts across the outers. These sizes appear to be ample to take up all the lighting load, as in one street we have 60 consumers out of 65 numbered premises, and tests taken show that the mains are large enough for

considerable lighting extensions, but I am very much afraid that this state of affairs would soon be upset by the wholesale use of cooking apparatus. A perusal of any heating catalogue would show that a cooking demand of 10 amperes would be quite a common thing in cooking just a plain family meal, hence it follows that half a dozen cookers on the positive, and a similar number on the negative, would quite load up the mains, and the point I would raise is, would it pay to lay down heavy copper to carry the cooking load when the maximum price one could charge would be about 1d. per unit? I have left out any question of plant, but a little consideration will show that if electric cooking at its present current consumption reached the height of popularity that gas cooking enjoys, the day load from 11.0 to 1.0 would far exceed the evening lighting load, and plant would have to be installed to meet this short demand in order to sell current at a cheap rate; and this question also applies to the circumstances under which supply will have to be given to the better-class houses where a late dinner is served, as not only the plant demand, but also the demand on the mains, will be on the top of the evening lighting load.

John B. Morgan, A.M.I.E.E.

Horsham, Sussex, *February 10th*, 1911.

ELECTRICITY v. GAS AT MANCHESTER.

THE Gas Committee of the Corporation of Manchester having complained of the policy of the Electricity Committee, a joint conference of the two Committees was held on January 11th, the Lord Mayor presiding, and the Chairman of the Gas Committee, Alderman Gibson, delivered a statement embodying his views. He charged the Electricity Committee with "unfair competition, which must result in disaster to both departments." Reviewing the history of the electricity supply undertaking, Alderman Gibson said that he was himself Chairman of the Committee during the first few years of its existence, but objected to the lavish expenditure incurred upon what he regarded as a prospective business, and severed his connection with it. While Mr. Wordingham was "rather a fast stepper," Mr. Metzger "was a racer," and large sums were expended upon the Stuart Street station; two 6,000-H.P. engines were ordered from Germany, and 22 transformer stations—twice as many and twice as costly, as necessary—were erected. Every year there was an enormous increase in capital and a lessened return upon that capital; last year, with a capital of £2,678,000, they made a profit of £12,000, less than ½ per cent., and only twice in 10 years had they made a profit exceeding 1 per cent. Moreover, as in his opinion they had set aside an altogether inadequate amount for depreciation and renewals, he believed they had in reality made no profit at all, but a dead loss.

It came to his knowledge that the Electricity Committee had agreed to supply electricity to a large number of new houses *en bloc*, provided that gas was boycotted altogether; he interviewed Mr. Howarth, chairman of the Electricity Committee, on the subject, and the arrangement was stopped. He had taken out a list of 34 firms, out of which the Gas Committee formerly made a profit of £1,000 a year, but which had now become customers of the Electricity Committee, having been secured "by unfair means at cut-throat prices." The Electricity Committee refused to divulge the prices that they were charging, declaring that to do so would be inimical to their best interests, and he believed that they dared not, because they had supplied electricity to these firms below cost price. That meant that they had more machinery than their normal business required; they could easily load it if they got customers at cut-throat prices, and would then come to the Council for more plant, after which the same policy would be pursued, and so on, until the time arrived when they came down with a crash. He had two bills in his possession which showed that the Electricity Committee were supplying at ¾d. and ½d. a unit, whereas the cost of production was 1½d. a unit according to their own statement. He would like to know how much Armstrong, Whitworth's paid per unit; the mains to their works had cost £7,500. Every ratepayer had a right to know the price. During the past 10 years the Gas Committee had paid £500,000 out of profits to the relief of the rates, but the Electricity Committee had paid only £38,000, while the liabilities of the former were £1,390,000 and of the latter £2,043,000. He would not permit the Electricity Committee to take another customer from the Gas Committee without stating the price charged such customer, and without the consent of the Gas Committee or the Corporation.

As no statement had been communicated to the Electricity Committee in advance, Councillor Howarth, chairman of the latter, did not attempt to deal with the matter in detail, but said he could not accept all the statements that Alderman Gibson had made. He suggested that a Joint Sub-Committee of the Gas and Electricity Committees, with four members of the Finance Committee, should be formed to thrash out such difficulties in the future, and further discussion was deferred pending consideration of the Alderman's statements in detail by the Electricity Committee.

The latter have now issued their reply. They point out that the Council have embarked upon the supply of electricity in order to prevent its monopoly by private companies, and that the original undertaking in the central area had always been of a highly remunerative nature. Owing to the municipalisation of the tramways, and the decision to supply the adjoining districts which were likely to be absorbed into the city, in 1900 the enlarged policy was adopted which had led to the present development. Had this not been done, private undertakings would have been set up in the out-districts, the competition of which with gas lighting, would have resulted in sheer loss to the Corporation, and these undertakings might have had to be bought out at heavy cost in the event of absorption. The work of supplying the out districts was purposely delayed until the Corporation were compelled by an action at law to carry out their obligations. Although the requirements of the electricity department were over-estimated, it was a travesty of the facts to say that even a large portion of the expenditure had been for "prospective business." In 1903, as surplus plant was installed, large users of power were catered for, but the load obtained was either new to the city or in displacement of private steam plants. As this business developed, additional generating plant was installed, but cost per KW. not more than one-third of the cost of the older plant, and the Committee were satisfied that this business, *per se*, showed a margin of profit.

Regarding depreciation, the Committee were under no obligation to do more than redeem the debt incurred on capital account within the lives of the assets concerned. They had, however, voluntarily built up a substantial renewals fund, providing for the replacement of all plant which was likely to have a shorter life than the corresponding debt-redemption period; the lives allowed for were as follows:—Machinery and switchboards and mains, 20 years; motors and meters, 10 years. No residual values had been taken into account, though these would certainly be considerable. As the renewals fund had not been started till 1904, leeway had to be made up, and all surplus revenue was appropriated for this purpose. Unfortunately, the formation of this fund had been checked by the introduction of the metal-filament lamp, following upon a reduction in prices in December, 1907, which would not have been made if the Committee had foreseen the effect of the new lamps.

Alderman Gibson, in comparing prices charged with costs, had fallen into the common fallacy of comparing the average costs of all supplies with the charges made to a particular class of consumer. Obviously, if this method were sound, every supply undertaking in the kingdom was grossly overcharging lighting consumers in order that power consumers might be supplied greatly below cost. In point of fact, the supply to the latter might possibly be more remunerative than that to the lighting consumers. The Committee explain at some length the necessity of charging for electrical energy on the basis of "fixed" and "running" costs, the effect of load factor and diversity factor, &c. The diversity factor of the power load in Manchester is about 40 per cent. of the possible power demand. The gas department has storage sufficient with a new gas-holder which is being installed, for more than a whole winter day, whereas the electricity department's storage is equivalent only to one-twelfth of the whole demand on the system for one hour; thus the two departments are very differently situated in this respect.

Regarding the 34 firms cited by Alderman Gibson, the Electricity Committee pointed out that eight of these were not consumers of the electricity department at all. In 13 other cases, the firms had commenced generating electricity for themselves, but afterwards came over to the Corporation supply. The remaining 13 were electricity consumers of long standing, who had adopted electricity years ago when the rates were very high. Thus the electricity department had not competed with the gas department in the cases cited. Regarding a similar but earlier list, the Electricity Committee had proved that out of the many thousands of horse-power obtained, less than 100 was formerly driven by gas—private steam plants were superseded, not gas plants.

The Committee had found it preferable not to divulge the prices charged to individual power users, because the cost of supply in any particular case depended upon so many factors; so much ignorance prevailed regarding this subject that it would be injurious to publish the prices without stating fully the conditions obtaining in each case, a course which was impracticable. On the only occasion when their policy had been publicly challenged, they were supported by the L.G.B. representative. The Committee had not given preferential treatment to any consumer or body of consumers: all were entitled to the same price if the conditions of supply were the same.

Nearly a million sterling of the capital outlay of the electricity department was devoted to tramway supply, on which no profit could be made, by agreement. If the price charged to the Tramways Committee were the same as the traction costs at Glasgow, where the tramways had their own generating station, the revenue of the electricity department would be increased by £20,000 per annum. Moreover, the supply to the out-districts had involved, and would for years to come involve, a continuous loss on working, estimated at £22,000 a year, which was more than made up by the consumers in the central area. The prices to the out-districts could not be raised, owing to the agreements made with the local authorities. The present Electricity Committee were in no way responsible for the "greater Manchester" policy which led to the loss above-mentioned. They strongly objected to any increase of prices as most undesirable and likely to arouse distrust amongst the consumers, and were of opinion that "the public weal demands the sale of electricity or any other commodity such as gas, water, &c., at as near cost as is con-

sistent with financial stability," the cost to include 1 per cent. return to ratepayers on the outstanding mortgage debt.

The Council in 1897 authorised the electric lighting of the whole of the tramway routes, and £13,000 had been expended by the Electricity Committee with this in view, but nevertheless, they had never been able to exercise this authority, and practically the whole of the streets of Manchester continued to be lighted by the Gas Committee: the Electricity Committee strongly recommended the establishment of an independent Street Lighting Authority to control the whole of the public lighting, as in other large cities. The merits of electric lighting would then receive fair consideration, and the city would gain by a raising of the standard of illumination.

While the Electricity Committee were obliged by the Council to supply the tramways at cost price, the Gas Committee were allowed the monopoly of street lighting at a price which, without doubt, yielded a handsome profit, they being, in fact, the Street Lighting Authority.

Regarding the sale of energy to power users at less than the price charged to the Tramways Committee, the Electricity Committee pointed out that the tramway load factor was only 29 per cent., while the average load factor of the large power users was 50 per cent., and many of the latter had load factors of 60 or 70 per cent. Moreover, the diversity factor of the tramway load was non-existent.

Again, the cost of the new plant per KW. was only one-third of that of the plant put down between 1901 and 1904, and the Committee, with the approval of the Tramways Committee, justified the lower charges to power uses partly by the lower cost of giving them a supply.

The Committee denied that any letter was written by their secretary to the Chorltonville Estate Co., debarring the use of gas in any of the houses for lighting purposes. Some 400 houses were to be erected, the supply to which was given through a master-meter and paid for by the landlord. Being relieved of the responsibility for collection, payment, &c., the Committee were justified in granting the landlord a lower rate than would have been possible if they had dealt directly with each of the consumers. They had no intention to boycott gas, or to enable the landlord to make a profit on resale. In some other cases, where considerable expenditure had been incurred on mains, and a monetary guarantee could not be obtained, the Committee had felt it necessary to ensure the return on their capital by asking that electricity should be used exclusively, or in the main, for illuminating purposes only; but they had no intention to boycott the use of gas. They desired to work harmoniously with the Gas Committee; competition between them was not only unavoidable, but salutary, and they were equally desirous that it should be fair to both sides.

Several appendixes were attached to the reply. One showed how the cost of the Corporation plant per KW. had attained a maximum of £120 in 1901, with 7,500 KW. installed; it fell to £75 in 1903, with 23,000 KW.; and to £59 in 1910, with 45,000 KW. installed. Another showed how the total costs per unit and average price obtained had fallen from 3·02d. and 3·125d. respectively in 1901, with an output of 8,000,000 units sold, to 1·22d. and 1·24d. in 1910, with 72,000,000 units sold. The yearly provision for depreciation, &c., a comparison between the daily load curves for gas and electricity, and a detailed schedule of the 34 firms referred to by Alderman Gibson, showing the dates when they became consumers, and other particulars, are set forth in separate appendixes, while the last, perhaps the most important of all, is a copy of a joint report drawn up by the gas and electricity officials on matters affecting the relationship between the two departments in June, 1910. This report was prepared on the suggestion of the Chairman of the Electricity Committee, and with the approval of the Chairman of the Gas Committee, and was adopted and approved by both Committees. It states that the officials had considered the prices charged by the respective Committees, and were convinced that all the prices of each department were fixed on recognised principles. Regarding the comparison of the working results of the two departments, the amount of "free capital" (*i.e.*, capital upon which no interest was payable, the debt having been redeemed) in each case was ascertained, showing that the capital outlay of the gas department was £2,851,184, of which £1,172,463 was encumbered, and £1,678,721 free; the capital of the electricity department was £2,678,629, of which £2,001,430 was encumbered, and £677,199 free. Allowing for 3½ per cent. on the total capital in each case, it was found that the net advantage gained by the gas department from the fact that so large a proportion of their debt had been repaid as compared with the electricity department, was £27,297. The actual amount paid to rate-aid in 1910-11 by the gas department was £46,500; deducting the above sum of £27,297 from this amount, as being due to free capital, the remainder was £19,203, representing ·67 per cent. of rate-aid on the total capital, while the electricity department contributed £15,000, or ·56 per cent. on their total capital, in aid of rates. In a separate report signed by the electricity officials alone, it is stated that the deficiency on the electrical side is likely to disappear in the future, but it should be borne in mind that nearly a million sterling, sunk in meeting traction requirements, is debarred from earning a profit, on the principle approved by the Council that one Committee should not make a profit out of the other.

The Joint Report further points out that in dealing with certain Gas Bills, Parliamentary Committees had laid down the condition that a maximum of only 1 per cent. on the outstanding mortgage debt should be paid in aid of rates; in the case of the Glasgow Gas Consolidation Bill last year, the gas undertaking was precluded from carrying any balance of profit to the credit of the Corporation for general purposes; "in fact, the (House of Commons) Committee specifically said that Glasgow ought to balance income and expenditure, and so supply at cost." It is clear that Parliament considers that the benefit, if any, to accrue to the ratepayers must be calculated on the outstanding mortgage debt as being the only true measure of the ratepayers' risk. If this principle were applied to Manchester, the gas department could not contribute more than £12,127, and the electricity department £19,701 to rate-aid. The officials are unanimously in agreement with Parliamentary practice as to the adoption of the mortgage debt as the basis upon which rate-aid should be computed, and believe that it would remove all grounds for criticism between the two departments in the future.

BUSINESS NOTES.

Coronation Electrical Illuminations.—We have already referred to the excellent catalogue issued by one well-known firm in anticipation of a large business in electrical illumination and decoration design in connection with the Coronation celebrations of next June. We now have before us three further lists issued with the same object.

That issued by the ELECTRICAL CO., LTD. (Lamp Department), 122-124, Charing Cross Road, W.C., is a 32-page art paper list, entitled "Some Illuminating Suggestions." The frontispiece shows in colour a very tasteful example of electrical draping. Inside the list, one first meets a number of white on black pictures of large building exteriors outlined with "Striplite" and miniature 2-C.P. 14-volt lamps; there follow examples of ceiling illumination with electrical decoration chain and 2-C.P. lamps, and of public gardens illuminated with "Striplite." Such prosaic but necessary details as prices, list numbers, lengths, brief general specification matter, and so forth, of "Striplite," decoration chain, reflector rosette signs, quicksilver flashers, and carbon-filament lamps, occupy the remaining half of the book.

THE BRITISH WESTINGHOUSE ELECTRIC AND MANUFACTURING CO., LTD., of Trafford Park, Manchester, have sent us an advance copy of an eight-page catalogue (No. 219/2), in which are given illustrations and particulars of their Coronation illuminating devices. The centre piece of the list is a two-page effective representation of the illuminations at the Great White City, where watertight lampholder lighting strip was used, some 151,000 lights being in service at last year's Japan-British Exhibition, against 121,000 and 112,000 lights for the Imperial and French shows respectively. A number of flat and rounded designs of letters, crowns and stars, are illustrated, also the "Trafford" illumination strip and reflectors, carbon-filament lamps, and cleat ceiling roses. Concerning the designs, these are supplied complete, and are easily erected. The frames are made in two types as mentioned, flat or rounded, and both types are in two sizes, the letters 3 ft. and 4 ft. in length, and the crowns and stars 4½ ft. and 6½ ft. The wood used is stated to be thoroughly dried and well seasoned, and finished with three coats of white oil paint. Frosted or coloured carbon-filament lamps are supplied. The "Trafford" crowns and stars are rosetted with patent reflectors; they are mounted on a painted frame, and fitted with coloured carbon lamps.

MESSRS. SIEMENS BROS. DYNAMO WORKS CO., LTD., of Dalston, N.E., have likewise just issued a 12-page catalogue of devices and accessories for Coronation illuminations. These include a description of the "Bro-ite" Coronation strip with aluminium or brass holders, carbon-filament lamps, lamp varnishes, obscuring lacquer, batten holders, lampholders, connectors and tumbler switches. Many appropriate devices, including crowns, letters with and without drapery, coats of arms, monograms, stars, and crystal glass devices. Prices and illustrations are given. Messrs. Siemens ask us to state that their trade friends should apply to them early in regard to these matters owing to considerable orders already booked and to the requests received for designs of complete decorative schemes. Orders and inquiries will be dealt with in the order received. They are prepared to quote for complete Coronation illumination schemes, but, in accordance with their regular practice, they are arranging to sublet all the wiring and erection among contractors, and any member of the trade can obtain a copy of the list on receipt of application, accompanied by trade card.

Electrical Equipment for new Battleship-Cruiser.—Messrs. Palmer's Shipbuilding and Iron Co., Ltd., have recently placed with MESSRS. VERITYS, LTD., a contract for an extensive electric equipment required in connection with the new battleship-cruiser included in this year's navy programme. Comprised in this contract is the provision of electric fans and of the electrical machinery required in connection with ammunition and other hoists.

French Duties.—The French Customs authorities have recently given a decision to the effect that in the case of imports of "dynamo-electric machines coupled to a ventilator of which the wings and frame are easily separable," the motor is dutiable as "dynamo-electric machines," the wings and cage being dutiable separately.

Board of Trade Commercial Department.—It is stated that the number of inquiries handled by the Board of Trade Commercial Intelligence Department during 1910 was 14,839 against 13,144 in 1909.

Carbide Production in Sweden.—It is reported from Stockholm that the sole production of carbide by the Alby Karbid Fabriks Aktiebolag cannot be carried on with great success, and that the owners, who have the Alby United Factories Co. at their back, have resolved to proceed with alterations. It is intended, for instance, to extend the existing plant by the erection of a works for the conversion of carbide into cyanide, and a fresh contract has been concluded with the Alby Electric Supply Co. whereby the carbide company will increase its custom from 6,750 H.P. to 11,000 H.P. per annum for 33 years, the price being reduced for this purpose.

German Glow Lamp Manufacture.—It is stated that the A.E.G. is at present in negotiation with the Frankfort city authorities in regard to the erection of a glow lamp factory at the works of the Lahmeyer Co. The question is being delayed owing to the intention of the town to locate all industrial undertakings as far as possible in the eastern harbour district.

California Pumping.—A correspondent says that Sir Robert Hampson, of Liverpool, who left for California on 18th inst. in connection with the business of the British Consolidated Oil Corporation, Ltd., intends to go into the question of applying electricity to the pumping of wells and the economies to be effected thereby.

Book Notices.—"British-made Goods and where to Get Them." December, 1910.—This is a three-language publication issued gratis by the Commercial Intelligence Bureau (1907), Ltd., 57-58, Holborn Viaduct, E.C. As its name indicates it is an index to British manufactures and their manufacturers. It is circulated free among leading buying and import houses abroad, in the Colonies, and in India.

"Text of the Korean Company Act of 1910." London: *Anglo-Foreign and Colonial Review.* 1s.—This Act, which came into force on January 1st, 1911, will no doubt be of interest to those who contemplate the promotion of electrical and other undertakings in Korea, for the conduct of which companies may be considered desirable.

"*Boletin* de la Sociedad de Fomento Fabril." Vol. XXVIII, No. 1. January, 1911. Santiago: *Imprenta y Litografia Universo.*

"*Proceedings* of the American Institute of Electrical Engineers." Vol. XXX, No. 2. February, 1911. New York: The Institute. Price $1.00.

"*Journal* of the United States Artillery." Vol. 35, No. 1. January, 1911. With Index to Current Military Literature. Fort Munroe: Coast Artillery School Press. Price 50 cents.

"*Bulletin* of the Imperial Institute." Vol. VIII, No. 4. London: Eyre & Spottiswoode, Ltd. Price 1s.

"The Elements of Telephony." By A. Crotch. London: E. and F. N. Spon, Ltd. 1911. Price 1s. 6d. net.

"Associaçao Commercial do Porto; Relatorio da Direcçao no Anno de 1910." Portugal: Officinas do *Commercio do Porto.*

Catalogues and Lists.—Messrs. Mavor & Coulson, Ltd., 47, Broad Street, Mile End, Glasgow.—Two illustrated pamphlets describing and giving tabulated horse-powers, speeds, prices, &c., of a new line of patent tube-cooled continuous current and three-phase motors, and of accessories for same.

Messrs. Thos. W. Ward, Ltd., Albion Works, Sheffield.—160-page catalogue of a great variety of machinery, engineers' machine tools and power plant which they have in stock or in progress.

The British Westinghouse Electric and Manufacturing Co., Ltd., Trafford Park, Manchester.—40-page brochure (art paper, fully illustrated with half-tones), entitled "Electric Motor Control." A large variety of starters and controllers are included giving an idea of the wide range of Westinghouse starting and controlling devices. All the apparatus illustrated are of standard patterns. Copies of the catalogue (S.P. No. 7,060) can be obtained on application.

From the Banner Electric Co., makers of incandescent electric lamps, of Youngstown, Ohio, we have received an interesting brochure entitled the "Allegheny County Soldiers' Memorial," wherein are given some prints in colour illustrating the novel and beautiful blending of illumination with architecture and decoration that obtains in this impressive building. The façade is illuminated by the direct light of mercury-tube lamps, Banner "Mazda" lamps, Moore tube, flaming arcs, numerous carbon and special reflector lamps are suitably placed, concealed or otherwise, according to requirements, and the result is most effective.

The Sloan Electrical Co., Ltd., 12, Golden Lane, London, E.C.—A 16-page catalogue of white porcelain insulators has just been issued by this firm. All the different shapes are illustrated and priced. A large stock is kept at the above address. Copies of the list are obtainable on application.

The "Kingolite" Co., 118-120, Wardour Street, London, W.—Leaflet briefly describing and showing, and giving prices of, their "Kingolite" patent ordinary and self-locking (thief-proof) lampholders.

Allgemeine Elektricitats-Gesellschaft, Friedrich Karl-Ufer 2-4, Berlin N.W.—Price list of enclosed distributing boxes for various numbers of ways, systems of distribution, &c.

Bankruptcy Proceedings. — Charles Hellyer Pearson (trading as Pearson & Co. and as the B.O.A. Engineering Co.), 51A, Mosley Street, Manchester, and Stockton Street, Manchester, and 4, Manchester Road, Hyde, Cheshire, electrical engineer, &c.—The adjourned public examination of the above debtor was held at the Court House, Quay Street, Manchester, last week, when the statement of affairs submitted showed a deficiency of £1,731. The Assistant Official Receiver stated, when the case was called, that the debtor had amended his cash account as ordered by the Court, and had supplied a list of patents he had taken out, and was interested in. Under the circumstances he (Mr. Johnston) asked that the examination be closed, as he had no further questions to put to the debtor. It is understood that Mr. Yearsley, incorporated accountant, of Brazennose Street, Manchester, the trustee appointed at a meeting of the creditors last month, has negotiated for the sale of the several businesses to the nominee of a syndicate. The examination was concluded.

William Henry Steed, motor and electrical engineer, 13, Stamford Street, Kingsway, Altrincham.—This debtor attended at the Court House, Quay Street, Manchester, last week for his public examination on accounts showing liabilities £336, and assets estimated to produce £297. In reply to the Assistant Official Receiver, the debtor said that he started business in December, 1906, at Altrincham, having a capital of £20 in cash of his own, and £40 which was lent to him by his father-in-law, Mr. John Kershaw. Prior to starting on his own account, he had been employed as an assistant with an electrical supply company at Altrincham. In 1907 he added to his electrical engineering business that of a motor-car engineer. His father-in-law died in August, 1907, and the £40 borrowed was still owing to the executrix. Asked as to the cause of his failure, the debtor said it was due to slackness of trade, and the loss sustained on a motor-car deal. Explaining, the debtor said he sold a new motor-car and took two old ones in exchange. The loss on this transaction (£75) alone more than accounted for his deficiency. He had also written off £105 on his stock in trade, in view of a forced realisation of same. His profits from the electrical engineering business were ample to cover his drawings for personal and household expenses. It was in December of last year he found himself in difficulties, owing to pressure being put upon him by creditors. The examination was closed.

John William Barnett (trading as Barnett & Hyde) electrical engineer, 25, Waterloo Road, Burslem, Stoke-on-Trent, Stafford.—Mr. Registrar E. P. Tennant held a sitting at the Town Hall, Hanley, Stoke-on-Trent, for the public examination of the above debtor, on accounts showing liabilities £510, and assets £57. The debtor attributed his failure to want of capital and insufficient profits to meet general expenses. In reply to the Official Receiver, the debtor stated that he commenced business with Mr. Hyde in May, 1907, each of them putting £35 into the concern. In January, 1910, the partnership was dissolved, and debtor paid Hyde out, giving him £35 in full settlement. An account was drawn up at that time, and showed a deficiency of £21; but this statement was incorrect, and instead of the deficiency being £21 it was several hundreds. The debtor continued the business until last October. Practically the whole of the liabilities were made up of goods supplied to him for business purposes. The examination was closed. March 9th is the last date for receipt of proofs for dividend by Mr. F. T. Halcombe, King Street, Newcastle, Staffs., the Official Receiver.

Valentine George Burkitt (trading as V. G. Burkitt & Co.), 38, Park Row, Bristol, electrical engineer.—In this matter the petition was filed by a creditor, the act of bankruptcy being that the debtor executed a deed of assignment for the benefit of creditors. The statement of affairs, which has been filed, showed liabilities expected to rank at £213 and assets £113. The net assets were £99. It appears that the debtor, who had previously acted as branch manager for a firm of electrical engineers in 1908, purchased the stock, fixtures, fittings and trade utensils of the business at 27, North Street, Stokes Croft, Bristol, of which he was manager for £40. He was without capital when he commenced, and in 1908 he removed his stock-in-trade, &c., to 38, Park Row, Bristol, where he traded until January, 1911, when he executed the deed of assignment already referred to. The debtor has never prepared any balance-sheet or taken steps to ascertain his financial position in any way. He ascribes his failure to bad debts, want of capital, and severe competition, and admits knowledge of his position since October last.

Dissolutions and Liquidations.—Arc Lamps, Ltd.—Mr. W. A. Henderson, 3, Fenchurch Street, E.C., has been appointed receiver and manager for the debenture-holders of this company.

The Electrolytic Apparatus Syndicate, Ltd.—This company is winding-up voluntarily, with Mr. Wm. Renison, junr., Queen Anne's Chambers, Westminster, as liquidator. A meeting of creditors is called for March 6th. Creditors must send particulars of their debts, &c., to Mr. Renison, by March 22nd.

Auto-Controllers, Ltd., Bournemouth.—Liquidator, Mr. C. B. Blissett, released February 13th.

Lepel Wireless Syndicate, Ltd.—Creditors must send particulars of debts, &c., to Baron Von Lepel and Albert Holt, the liquidators, at the Cecil Chambers (West), Strand, W.C., by March 16th.

Langdon-Davies Motor Co., Ltd.—A meeting of this company has been called for Wednesday, March 1st, at 3 o'clock, at the offices of Chas. F. Cape & Co., 12, Coleman Street, E.C., by Mr. C. F. Cape, the liquidator.

Trade Announcements.—Messrs. E. Brook, Ltd., of Huddersfield, have opened a showroom and sales department at 70, North Street, Leeds, for the convenience of customers in the North of England and Scotland and in the West Riding of Yorkshire. The firm have hitherto been somewhat handicapped by being placed in Huddersfield off the main lines to London and the North. In the more central city of Leeds this showroom is fitted up with the latest alternating-current motors. Telephone, No. 3022 Central Leeds."

Messrs. A. Hunter & Co. have commenced business at 4, Eagle Street, Holborn, W.C., as suppliers of ignition cells, &c., and also for effecting repairs of accumulators, battery charging, &c.

The Sunbeam Lamp Co., Ltd., have removed their Birmingham depôt to 30, Church Street (No. 6952 Central), and their Newcastle depôt to 48, Blackett Street (No. 2224 Central), where they will have greater convenience for carrying stocks of their "Sunbeam" lamps, accessories and other electrical material.

Messrs. Whipple & Co., electrical engineers, of Liverpool, announce that they are relinquishing the retail department of their business.

According to the *Australian Mining Standard*, the firm of Haes and Eggers, Ltd., has been registered as a company with a capital of £10,000 in shares of £1 each, and will acquire the business of electrical and mechanical engineers lately carried on in Sydney by Messrs. Haes & Eggers at 163, Clarence Street. Messrs. H. F. C. Eggers and D. A. Bensusan are the first directors.

LIGHTING and POWER NOTES.

Acton.—The Metropolitan Electric Supply Co. is claiming £272, being the difference between the cost of the units purchased and the minimum payment, after allowing for correction of the maximum demand for the year. The number of units that could be obtained would be 151,833.

Aldeburgh.—At a meeting of the T.C., on Friday, it was stated that the prov. order for E.L. had been applied for by the Corporation. It is understood that the order will be taken over by a local company to be formed, with a capital of not less than £5,000, by Messrs. Christy Bros., of Chelmsford, the Council to have the option of purchasing the undertaking at the expiration of 28 or 35 years. The Council will also have the town lighted by electricity at 37s. 3d. per lamp per annum, and the company undertakes to supply current for motive power at the sewage and water works at 2d. per unit for the first 3,000 units per quarter, and at 1½d. per unit beyond.

Australia.—Included in the list of railway works to be carried out in Victoria with a new loan is "electric cranes and capstans for Melbourne, Ballarat, Bendigo, Geelong, £14,700."—*Australian Mining and Engineering Review.*

According to the *Australian Mining Standard*, the Sydney main street lighting has been much improved by the substitution of new arc lamps, and eventually the whole of the old lamps will be replaced.

Birmingham.—Recently the electricity and gas departments of the Corporation were invited by the London and N.W. Railway Co. to submit schemes and give demonstrations of improved lighting at New Street Station. As a result, a high-pressure gas scheme has been installed on No. 1 Platform and a modern electric lighting installation on No. 3 Platform. The latter has been designed by Mr. Haydn T. Harrison, and provides for showing four distinct schemes—lighting by Excello arc lamps; by groups of metal-filament lamps; by metal-filament lamps, using alternate fittings, &c.; and by a combination of arc and metal-filament lighting. The electrical installation was recently inspected by the municipal authorities and railway company's engineers; it has been carried out by Messrs. Reynolds & Bradwell, of Birmingham.

Bishop's Stortford.—The B. of T. has revoked the 1905 electric lighting order.

Canada.—A supplementary estimate has been submitted to the Ontario Provincial Legislature providing for an advance of about £226,000 to the Government Hydro-Electric Commission, for the purpose of completing the Niagara transmission lines, including additional extensions to Tilsonburg, Weston, Port Credit, Brampton, Mitchell and Seaforth. Communications regarding this matter should be addressed to the Hydro-Electric Commission, Bay and Richmond Streets, Toronto.—*Board of Trade Journal.*

Carnarvon.—The T.C. has received from the L.G.B. sanction to a loan of £1,449 for electricity purposes. With reference to another loan for street lighting, the L.G.B. has asked for further information as to the comparative cost of lighting by electricity and gas.

Chile.—Messrs. R. Valenzuela & Co. have obtained a ten years' concession to provide the town of Tacna with electric light. The installation must be completed within 12 months.—*Board o Trade Journal.*

Continental Notes.—Belgium.—La Société d'Electricité de l'Est de la Belgique, of Brussels, has submitted the lowest tender for the supply of electrical energy for public and private lighting and also for power purposes in the town of Theux. The price quoted is equal to '44d. per kw.-hour for power and 2½d. for current for private lighting purposes.

Russia.—A company is in course of formation under Belgian auspices to establish a central station for the supply of electricity for lighting and power purposes in Baku, the great oil-producing town in Caucasia.

Germany.—The municipal central electric lighting station at Dantzig is to be extended at an estimated cost of £50,000.

A contract has been signed by the T.C. of Cologne with an important electrical concern for the supply of public lighting, a stipulation of the contract being that the lignite which exists in profusion in the province, is to be used as fuel for the generation of the current supplied. The employment of lignite for the same purpose, but a still larger scale, is to be carried out in the provinces of Brandenburg and Saxony, the great Lauchhammer mining and ironworks company having decided to inaugurate what is claimed to be "the first transmission of energy at 110,000 volts in Europe." The company's works are situated at Burghammer, Lauchhammer, Görlitz and Riesa, each of which has hitherto had its own generating station. It is now proposed to erect one huge steam generating station to obtain power from the local deposits of lignite, which are of considerable extent. In addition a large district central station is to be built at Groba, in Saxony, to supply the districts of Grossenheim, Meissen, Ostschatz and Dübeln. The first equipment of the new central station at Lauchhammer will consist of three turbo-dynamos of 5,000 kw. each, and the installation of two others will follow. The contracts have been placed with the firms of Siemens-Schuckert, the A.E.G., and the Maschinenfabrik Augsburg. The adoption of the pressure of 110,000 volts has been made after a comparative study of the various systems in use in Europe. The transformers and switchboards will be supplied by Siemens-Schuckert, the former being oil-cooled and of 6,500-kw. capacity, stepping up from 5,500 to 110,000 volts. On completion, the total power of the transformer station will be 40,000 k.v.a. The current will be carried by two overhead lines to Görlitz and Riesa, a distance of about 50 km., and these will also be coupled by a 60,000-volt line. The Bergmann Co., of Berlin, has been entrusted with the construction of the transmissions.—*L'Industrie Electrique.*

Portugal.—The Portuguese Ministry of the Interior has approved a contract entered into between the municipal authorities of Caminha and Antonio Lourenço da Cunha, whereby the latter undertakes to supply with electric light the town of Caminha as well as the districts of Gontinhaes, Moledo, Lanhellas, Seixas, and Villar de Mouros.

France.—A company styled La Compagnie Générale des Exploitations Industriales, is about erecting its first generating station in the valley of the Eure, for the supply of 22 towns, as well as mines and the farming community, with light and power. Its network will have an extent of 30 kilometres. Its first works will be situated at the Falls of Cocherel, on the River Eure. They will be equipped with two turbines, supplemented by two groups of motors. Current will be distributed at high tension, 5,000 volts, by cable, and will be stepped down to 110-115 volts for lighting, and 190-200 volts for power by transformers, the property of each town and locality served. Considerable eventual extensions of the initial plant are anticipated.—*L'Industrie Electrique.*

Dumbarton.—There has been launched from the shipbuilding yard of Messrs. McLaren Bros., a vessel built to the joint order of that firm and of Messrs. Mavor & Coulson, electrical engineers, Glasgow, and official trials on the Firth of Clyde will take place shortly. The ship will be propelled by machinery consisting of a four-cylinder 45 b.h.p. Crossley gas engine, using producer gas, with electrical transmission to the propeller. Built primarily for demonstration purposes, in order to show the efficiency of electrical propulsion, the vessel has been fitted with two saloons, and will have a Board of Trade certificate for 50 passengers.

Ealing.—A L.G.B. inquiry was held into an application of the T.C. for sanction to borrow £20,000 for electric lighting, viz., £7,000 for mains, £8,000 for service lines, and £5,000 for meters. The electrical engineer (Mr. J. D. Knight) said, in reply to questions from the Inspector (Mr. H. R. Hooper), that it was expected that metallic-filament lamps would bring a considerable amount of new business; in addition to which they had entered into agreements with builders in 11 roads, the houses in which would be wired for electricity, while a large estate with 60 houses was also being developed. Further, the practice of cooking by electricity was making fairly rapid strides, and there was little doubt that Ealing, being a residential suburb, would put in cooking apparatus to a very large extent. The Inspector remarked that it would cost the borough more to borrow money for meters than if they were paid out of current revenue. He went on to say that there were not half-a-dozen local authorities in the country, unless they were without revenue, and only had recourse to the rates, that were borrowing for meters. Practically all are now paying for instruments, meters and furniture out of revenue, and many are paying for all services in the same way, realising that it is cheaper to take them out of revenue. The crux of the soundness of the undertaking was in keeping the capital expenditure down as low as possible. In reply to observations by the chairman of the Electricity Committee (Alderman Peal), and the town clerk, the Inspector said that Ealing was the first local authority he had come across which had advanced the argument that it was desirable to spend on the capital account when there appeared to be no necessity for doing so. The chairman of the Electricity Committee said that he could not accept the suggestion that they should stop borrowing money for meters. The Inspector then said that he would make a note to the effect that the Council were desirous of borrowing £5,000 for five years, first, because it was a matter of accountancy and principle, but at the same time it was admitted that interest would be saved on the loan. The town clerk said that they never had to pay more than 3½ per cent. on the money borrowed, while they were able to invest their surplus at 3¾ per cent. The Inspector further went on to say that for every unit sold in Ealing it was costing the authority over 2d. to the moneylender. The Inspector having again made his suggestion

without result, that the application to borrow £5,000 for meters be withdrawn, the inquiry was brought to a close.

Fleetwood.—The U.D.C. has entered into an agreement for supplying the Fylde Ice and Cold Storage Co., Ltd., with electrical energy.

Hampton.—The D.C. has decided that failing a satisfactory reply from the Hampton Court Gas Co., to an application for a reduction of its present charges, formal notice be given to determine the existing contract for street lighting, and that quotations for the supply of electricity for street lighting purposes be obtained from the Twickenham and Teddington Electric Supply Co., and that it be requested to state in what other roads in the district it will be at once prepared to lay cables for street lighting purposes.

Hornsey.—The electrical engineer has been instructed to prepare plans and estimates for the provision of an additional boiler, &c., for next winter. He is also, in co-operation with the borough engineer, to obtain the necessary information in regard to the consequent extension of the boiler house. Mr. Double suggested that some inquiries should be made as to whether it would not be cheaper to take a bulk supply from some power company, and he asked for an assurance that no great extension of the generating station and plant would be undertaken without the Council's consent being first obtained.—Alderman Wilson, chairman of the Committee, said he had no hesitation in giving this assurance. All that was being done at present was the obtaining of preliminary information, in order that particulars of what was necessary might be laid before the Council. An extension of the machinery would probably be required for next winter.

Huddersfield.—The revenue statement of the electricity department for the year ended December 31st, 1910, shows that the total income was £35,209, of which single-phase lighting accounted for £22,308. The total expenditure was £21,516, leaving a surplus of £13,693. The balance of £656, left after allocation of sums to interest on loans account is to be transferred to the depreciation and contingencies account.

The Corporation has decided that electricity be supplied for outside Coronation decorations at 1d. per unit; that meters be fixed and removed at a charge of 10s.; and that special services shall be supplied only at the cost of the consumer.

Hyde.—The British Westinghouse Co. is installing, on behalf of Messrs. Edward Hibbert & Co., of Hyde, 150 motors for the individual driving of looms for a new shed they are building.

Ipswich.—The B. of G. has decided to engage an electrical expert to advise it as to what economies can be effected in the heating and lighting of the workhouse.

Japan.—An accident recently occurred at the main electric power house of the Kure Naval Arsenal, Japan, owing to the sudden movement of one of the steam turbine-dynamo sets. The machine, which was running at a high speed, was smashed, and a foreman and two employés were injured. The damage is estimated at £10,000.

Leatherhead.—The Electricity Co. has applied to the B. of T. for permission to adopt the Stannos system, whereby cables can be laid partly underground and partly on the outer walls of houses, thereby minimising the expense and avoiding the disturbance of footpaths. The U.D.C., whilst recommended not to offer any objection, has decided to ascertain where the system is at work and what are the advantages to the public.

Leominster.—A member of the T.C. has given notice to move that expert opinion and advice be taken on the E.L. question. A company has submitted a scheme to the Council, but this has not been adopted, in order that the Corporation may consider a scheme of its own.

London.—BERMONDSEY.—The Electricity Committee reports that, in order to meet next winter's demand, it will be necessary to either install new plant or take a bulk supply. If new plant is decided upon the following will be required:—Three new boilers, each with a capacity of 15,000 lb. steam per hour; one steam-dynamo, capacity 1,250 KW.; condensing plant of 36,000 lb. capacity. Extensions to the boiler house for the boilers will also be needed. The borough electrical engineer's estimate for the above is £20,100. The absolute maximum the station is capable of supplying is 2,225 KW., but this cannot be considered as the safe working capacity of the station; there should be a reserve or standby. The larger steam dynamos run on an average from 100 to 130 hours per week at full load. The largest set has not been in quite two years, has generated 4,618,100 units, and since it was installed there have been connected to the mains no less than 1,033 KW. Should either of the large sets fail, the Council would not be in a position to supply the present winter requirements. The interest and redemption on a loan of £20,100 will be £1,400 per annum. A surplus this financial year of about £1,400 is expected. Next financial year (*i.e.*, year ending March 31st, 1912) the surplus should be greater; and as the new plant cannot be installed until the end of September, the loan will not, therefore, be taken up till September, and not more than half the interest and redemption will come into the ensuing financial year. The question of a bulk supply is still under consideration, and when the Committee has received the tenders it will be in a better position to come to a final decision and report fully to the Council.

At Tuesday's Council meeting the resignation was accepted of Mr. W. J. Oake, the father of Mr. C. J. Oake, switchboard attendant, who a fortnight ago was an applicant for the post of third engineer. Mr. Oake resigned his seat on the Electricity and Street Lighting Committee, and also the chairmanship of that Committee. In his letter of resignation he wrote:—"It is with some regret that I have decided to retire, but the events of the Council of Tuesday last leave me no other source." The events to which Mr. Oake refers were the decision of the Council not to appoint his son third engineer, as proposed by the Electricity and Street Lighting Committee, and the instructions of the Council to the Committee to submit three candidates for the post.

BATTERSEA.—As a question has arisen as to the exact nature of the alterations recently decided in the charges for the hire of meters for power supply, it is explained that the scale is to be amended so as to provide for the payment of 1s. per quarter (in lieu of 3s. now charged) for meters for power supply, when the quantity of energy used does not exceed 15s. per quarter. The altered scale is to take effect from the date of recording the meter indices for the current quarter. In the event of a consumer requiring to be supplied with a certified meter, the cost of certification is to be borne by him.

ISLINGTON.—The Lighting Committee reported at the last meeting of the B.C. as follow:—"We have carefully considered the Council reference of January 20th last instructing us to consider as to the result of the substitution of high-pressure gas for electricity in the borough, and to report what steps we recommend should be taken to safeguard the interests of the ratepayers. We are informed by the electrical engineer that a number of electric lamps outside shops in the main thoroughfares of the borough have been displaced and high-pressure gas lamps installed in lieu thereof. The Council will recognise that it is very desirable that some immediate action should be taken to prevent the displacement of electric lamps for outside shop lighting, and, in our opinion, this can best be effected by the adoption of that portion of the Committee's report, submitted to the Council on December 16th last, which deals with contract lighting." The report was received without comment.

HACKNEY.—The Electricity Committee reports having had under consideration the question of increasing the present steam generating plant at the electricity works. Since last October it has been necessary to raise steam in five of the six boilers in the coal-fired boiler house in order to meet the demand over the peak of the load. With the normal growth of the demand, next winter's peak will require that every boiler shall be under steam. It is proposed to make the best use of the vacant space at the northern end of the existing boiler house by installing a pair of water-tube boilers with chain-grate stokers and superheaters, each boiler being capable of evaporating 16,500 to 17,000 lb. of steam per hour. In addition to the boilers, an electrically-driven feed pump of about 5,000 gallons per hour-capacity must be provided, also the necessary pipework. The Committee also thinks it desirable to include in this extension, automatic exhaust valves for Nos. 3 and 4 engines. A specification will be issued for the supply and erection of the two boilers, and they will be inspected during construction at the maker's works by the Vulcan and General Insurance Co., Ltd., who ultimately will insure the new boilers along with the existing boilers. The estimate of the cost of the whole of this work is as under: Two boilers and superheaters, chain-grate stokers, and extension of existing shafting, £3,500; turbine pump and valves, £200; pipework, £400; inspecting and testing fees and contingencies, £200, total, £4,300.

Matlock.—The U.D.C. has been informed that the promoters of the railless traction scheme have no intention of applying for an E.L. order, but they will generate their own electricity for motive power for the cars.

Mexico.—A large hydro-electric power plant is to be erected on the Balsas River, with turbines capable of generating 30,000 H.P. The contract for the electrical engineering has been let to a German firm established in Mexico. It is stated that the power is to be used to run electric tramcars between the mining and timber camps and the automobile road which has recently been completed between Iguala and Chilpancingo, the capital of Guerrero.—*Board of Trade Journal.*

Perth.—A correspondent states that the convener of the Corporation Lighting Committee has submitted a series of statistics dealing with the respective costs of gas and electricity, at a meeting of the T.C. By way of experiment, it seems, a standard fitted with gas brackets was erected in an open space at the entrance to the new City Hall. If the gas rivalled electricity in point of brilliancy, it apparently proved a costly luxury; £1 2s. 6d. was the cost of burning gas in the three lamps with which the new standard is fitted, while the same light could have been obtained from electricity for the same period for 7s. 6d. In the discussion which followed, several Councillors favoured the street being partially lighted with gas, on the ground that "electricity was liable to fail at the most inopportune moments, and sometimes with most disastrous effects." While admitting the imperfections of electricity, the convener did not see why that should lead them to squander money in burning gas. The more antiquated form of illumination, he argued, could still be retained as a standby, but there was no reason why they should use it except in cases of emergency. The convener's reasoning carried the day, and electricity was adopted.

Sicily.—A big scheme—that of utilising all the available water-power on the Island of Sicily—is being developed by the Société Elettrica della Sicilia Orientale. It is stated that there is an enormous field for a supply of electrical energy at a cheap rate. Machinery to the extent of over 20,000 H.P. being in use at the various sulphur mines. As a commencement it is proposed to estab-

lish a steam-operated generating station at Syracuse, and water utilisation plants at Cassibile and Aliantaro.

Stoke-on-Trent.—The Corporation is faced with a very serious problem so far as its electricity undertaking is concerned. Under the control of the Corporation are works at Burslem, Hanley, Longton, and Stoke, and at all these works, with the exception of Longton, further plant will be required for the winter of 1911. This will be seen from a comparison of the maximum load on the plant in 1910 with the present installed capacity without spare. At Burslem the maximum load was 746 KW. and the capacity was 650; at Hanley 1,304 and 1,300 respectively; at Longton 250 and 300; and at Stoke 624 and 550.

As the electrical engineer (Mr. C. H. Yeaman) points out in an interesting preliminary report which he has prepared upon the subject, at Burslem, Hanley and Stoke the peak load exceeded the normal capacity after allowing one of the larger units as spare or reserve.

This is not the only difficulty confronting the Electricity Supply Committee. The Fenton area has hitherto been supplied by simple mains extension from the Stoke works, with, where necessary, minor mains from the Longton area. The present L.T. mains from Stoke are practically loaded up, and therefore extensions in this direction are inevitable. In the course of an interesting report on the advisability of linking up the several undertakings, Mr. Yeaman states "combination is not possible in any simple scheme, as the works are all laid down complete with separate systems of mains which run out from the several generating stations, and could not be coupled by joining the mains together where they are adjacent.

"I recommend as the basis for consideration that the system to be adopted be an extra-high-tension three-phase alternating one, with 6,500 volts and 50 cycles, that to start with, two turbo-generators of 1,000 to 1,500 KW. be installed in an extension to one of the existing works, with the necessary boilers and auxiliaries, and that trunk mains be laid between the existing works, with the necessary sub-station plant."

Mr. Yeaman's estimated expenditure on plant extensions is as follows:—

Scheme 1.—New transmission system. Sufficient to make a start. Three-phase, extra-high-tension transmission to sub-stations with motor-generators, rotaries or motor-converters.

Generating section.—Two turbo-alternators...	£10,000	
Switchgear, buildings, &c.	10,000	£20,000
Transmission section.—Ten miles of cables laid from generating station to sub-stations	—	20,000
Sub-stations.—Six sets of transformers and converters with switchgear	6,000	
Buildings and accessories	4,000	10,000
Total		£50,000

This total will be increased by any additional mains required to give duplicate supply, and for distribution to consumers on the route. For this £10,000 will be required within the first two years, probably making a grand total £60,000.

Mr. Yeaman states:—

This will represent an additional burden of financial charges, common to the four undertakings, of nearly £4,000 a year. Part of this will be met by savings in generation costs, a second part will be covered by increase in the revenue due to tapping new areas and additional output, while the remainder will absorb the former profits. I estimate that if the repayment of capital can be deferred for three years, the scheme could be carried out without any loss.

Scheme 2.—Extending existing works:—

BURSLEM.—Additional turbo-generator, with new boiler, condenser and switchgear for 600 KW. ...	£7,000
HANLEY.—Additional steam alternator, condenser and switchgear for 600 KW.	6,000
STOKE.—Extension of buildings, steam generator, condenser and extra switchgear for 500 KW. ...	5,500
Total	£18,500

The previous estimate for a 300-KW. set at Stoke on exhaust steam, with necessary extensions, was £4,370. It is not, however, merely in the plant that money will have to be spent. The low-tension feeders are being loaded up, boosters are becoming numerous, and besides adding to the capital cost in themselves and for housing, they represent a wastage of power while running. I estimate that in five years the cost of extending the low-tension system will be equal to that incurred in adding a new system, and in the next 10 years there will be a large saving by adopting the first scheme.

Scheme 3.—FENTON.—The cost of low-tension mains to supply Fenton has been estimated at £6,072, in addition to the amount already spent. By the new scheme the major portion of this sum will be saved, as the Fenton supply will be taken off mains laid at the same time as and forming a part of the new scheme. The proposal is based upon what has been done in similar cases where problems of the same character have had to be met.

A special Sub-Committee having visited works at Liverpool, Manchester, London and Birmingham, the Electricity Committee has resolved:—

"That future extensions be made by adding at one of the existing works plant on the three-phase extra-high-tension alternating-current system, with sub-stations, generally as set out by the engineer in the first scheme."

This resolution was to come up for confirmation at the meeting of the Council on Thursday.

Truro.—The T.C. has instructed the General Purposes Committee to take steps to ascertain what demand there is in the city for an electric supply.

Turton.—The U.D.C. has applied to the B. of T. for consent to placing above ground, along various routes, electric lines for the transmission of electrical energy at a pressure of 230 volts for the purposes of supply under the Turton Electric Lighting Order, 1909.

Uphall.—Linlithgow County Council has delayed consideration of the Uphall Lighting Committee's request for an extension of the district electric lighting plant until a balance-sheet on the present undertaking has been issued. The Committee asked for power to borrow other £2,000, contending that that was necessary to meet the increasing demands for energy.

Uttoxeter.—With reference to the E.L. scheme submitted to the U.D.C. by Mr. Tiddeman, that gentleman has been asked to confer with the Council in Committee. If the Council does not care to embark on the scheme, and will not oppose, it is proposed to form a company to carry out the project.

Wakefield.—The L.G.B. has sanctioned the payment of a deficit on the electricity department of £2,258 by instalments extending over three years. This decision is looked upon as being fair and reasonable.

York.—The T.C. has decided to apply to the L.G.B. for a loan of £15,000 for additional plant, as mentioned in our issue of February 10th.

TRAMWAY and RAILWAY NOTES.

Argentina.—It is reported from Brussels that the Buenos Ayres, Port and City Tramway is concerned with a Government concession for the construction of a new line to Tigu, a popular waterside rendezvous, and this line will at one point compete with the Anglo-Argentine Tramways.

Australia.—Proposals are being made to introduce the Edison battery car on several of the horse tramways in the neighbourhood of Melbourne. The construction of the Geelong tramways has been taken in hand by the Melbourne Electric Supply Co.

Barbados.—The Canadian Trade Commissioner in Barbados states in a recent report that a syndicate of Canadian and United States capitalists, acting through an agent in Barbados, have purchased the mule tramway system of the Bridgetown Tramways Co., and intend to electrify the line and extend it. A system of trolley cars is to be introduced, and new rails are to be laid. The cost of these works will probably reach £100,000.—*Board of Trade Journal.*

Belfast.—At the fortnightly meeting of the Tramways and Electrical Committee on the 20th inst., the wages of tramway employés, who are agitating for an increase, was discussed on the receipt of a communication from Mr. Greig, of the National Amalgamated Union of Labour. A report from the general manager (Mr. Nance) was read, and as a result the Committee decided to recommend that the men's wages be raised to 7d. per hour for all motormen and conductors who had been seven years in the service of the Corporation. The Committee had previously agreed to offer this to men of ten years' service.

Birkenhead.—The scheme for the linking-up of Birkenhead and Wallasey by electric tramways has been revived in a public speech delivered by Mr. Wyld, manager of the Birkenhead Corporation tramways department, in the course of which he suggested that the best plan would be to connect the present dock route with the Wallasey extension to Mill Lane, over the Pool Bridge, to Liscard. This would give them an almost straight line to New Brighton. The distance approximately would be about five miles, and with four cars belonging to Birkenhead and four to Wallasey, they would be able to run a ten minutes' service from Woodside to New Brighton. With increased facilities they would create an altogether new traffic, which would not only pay the increased capital charges of the extension, but also the working expenses, and leave a satisfactory profit to the Corporations.

In an interview with a representative of the ELECTRICAL REVIEW, a prominent member of the Wallasey T.C. expressed the opinion that there was every prospect of the greatly-desired improvement being effected in the near future. The Tramways Committees of both boroughs, he went on, were thoroughly in sympathy with the scheme. Incidentally, the Wallasey Tramways Committee would gain considerable advantage to their existing system, as well as providing the additional power for the cars, by the utilisation, at an inconsiderable expense, of the destructor works at Gorsey Lane, as a generating station supplementary to their power house in Liscard.

Blackburn.—On Tuesday a statement was issued showing the working of the Corporation tramways for the nine months ended December 31st. The working expenses were £29,117, equal to 8·18d. per car-mile. The income amounted to £45,932, being equal to 12·89d. per car-mile. Of the balance of £16,815 carried to net revenue account, £15,890 was expended in repayment of instalment of loans, sinking fund, &c., leaving £1,031 profit balance on the nine months' working.

Bollington.—The U.D.C. has decided to petition against the Bill of the Macclesfield and District Railless Electric Traction and Electricity Supply Co., Ltd.

Continental Notes.—ITALY.—With an eventual locale at Rome, a syndicate to constitute a joint stock company has been formed, which will undertake the building and working of a normal gauge electric railway from Tirano to Bormio. The style chosen—Società Anonyma Ferrovie dal Orther—indicates that the continuation of this railway on to Austrian territory, as far as Mals, is intended, in order to make a junction with the existing Vintsgau line (Bozen-Meran-Mals), and its future extension to Landeck, in the Inn Valley, thus providing the shortest connection between Milan and Munich. There is also another connection whereby the existing permanent way between Milan, Innsbruck and Vienna will be considerably reduced. This is the scheme, already under the consideration of Austrian engineers, for a line from Meran through the Passier Valley to Sterzing, in which the syndicate named takes great interest.

SPAIN.—The Compania del Sur de Espana has inaugurated electric traction on the stretch of its line comprised within the stations of Gergal and Santa Fe, three-phase current at 5,000 volts being used. To supply this a station has been set up at Santa Fe de Mondujar, equipped with a steam plant and a generator developing 1,500 KW. From this the five locomotives acquired by the company are supplied, drawing trains of 250 tons at a speed of 30 km. an hour.—*Industria e Invenciones.*

RUSSIA.—It is stated that the Moscow police are being instructed to drive electric cars, in order to safeguard the tramway service in case of strikes.

SWITZERLAND.—Switzerland now possesses eight main lines, and 56 narrow-gauge lines worked electrically. The latter are mountain lines, and are of a purely local character. The current for the working of these lines is supplied by 40 hydro-electric generating stations. The electric main lines are very short, but in four years' time all this will be changed, for besides the portion of the line from Brigue to Iselle, including the Simplon Tunnel, now in working, the Lötschberg will be opened, so that electric traction will be set up from Spiez to Iselle in addition, and within the period named, the preparatory works for the electrification of the St. Gothard line will have been completed.—*Schweitzerische Techniker Zeitung.*

Dundee.—At a meeting of the Corporation Tramway Committee, Councillor W. H. Buist spoke in favour of the establishment of the trackless trolley system along Clepington Road between Strathmartine Road and Forfar Road. He believed that the introduction of the system and the linking up of the services in this district would not only pay working expenses, but would leave a surplus. The Committee agreed that Mr. Fisher, the manager, should revise a report he prepared some time ago on the subject, and bring it up to date.

The plea for some form of concessions put before the Council last week by a deputation from the Dundee Tramway Passengers' Association was discussed at last week's meeting of the Tramway Committee. Mr. Spence, the convener, in dealing with the point raised as to the contribution from the tramways to the common good, said that there was no doubt that the common good was security for the undertaking, and while it was not likely that the common good would ever be called upon to liquidate anything on the tramways, they should, in his opinion, continue the contribution. As regards the charge for power, while he thought they were overcharged, still the rate was as arranged by the departments not long ago. After discussion, it was moved that the manager report on the question of issuing season tickets and blocks of tickets, and this was agreed to. Mr. Fisher, the manager, submitted figures showing that the average fare paid per passenger in Glasgow was '091d. more than in Dundee, and that if the Glasgow average was reduced to equal that of Dundee, it would mean a reduction in revenue of £84,452.

Dover.—The Sunday tramway question has been before the T.C., which has come to the conclusion that it is inadvisable to take another poll of the town on the matter, until ten years have elapsed since the last poll. Needless to say, this decision has aroused dissatisfaction, and the matter will again be brought up at an early date.

Dunoon.—For some time past Dunoon T.C. has been considering representations made by the promoters of the proposed local tramways. Proposals which the T.C. has not entertained are that it should bear the cost, £8,000 or £10,000, and that it should acquire the necessary ground for widening certain streets, at the expense of the company. The conditions jointly agreed upon are that the passenger fares do not exceed 2d. per mile, and that the tramways are to be ready for use within two years after the passing of the order authorising the works. The scheme embraces a double line from Dunoon Pier to Kirn Pier—about a mile—and from Dunoon Pier along Argyll Street and John Street, with single connecting lines to Victoria Bridge, the public park, and from Kirn Pier to the burgh boundary beyond Hunter's Quay. Although the most expensive and important items in the scheme have not yet been agreed upon, it is considered that some arrangement will be come to in the near future.

Hendon.—At a special meeting of the District Council, a recommendation of the Works Committee, that a system of railless trams be permitted from near the Tube Station, Golder's Green, to the Edgware Road, was considered. After a long discussion, the recommendation was carried with three dissentients. It was mentioned that the London General Omnibus Co. proposes to extend the present Child's Hill service of motor-omnibuses to Hendon Village about the end of March, or early in April.

Hyde.—The T.C. has requested the Joint Tramways Board to consider the advisability of providing trackless trolley cars between the tramway terminus at Hyde and Roe Cross, *via* Mottram Village.

Liverpool.—The section of the Lancashire and Yorkshire Railway Co.'s system between Maghull and Town Green, on the Aintree branch lines, which has been undergoing electrification, will, it is anticipated, be open for traffic about the beginning of March. Work on this stretch of three miles was commenced during November last.

Nelson.—The B. of T. is about to conduct an inquiry into the proposal to establish a through service of electric cars between Nelson and Colne. The Nelson cars are to be equipped with a new brake which has proved satisfactory in a trial run between the two towns. Through running is hoped to be established during March.

Quarry Bank.—The Quarry Bank Light Railway Committee—which includes representatives from the Brierley Hill Quarry Bank, and Rowley U.D.C.'s—is to be convened shortly in order to finally consider the possibility of utilising the light railway order held by the Councils, and which lapses on July 31st. In this instance, an optimistic feeling prevails as to the probability of progress being made and something being done to carry out the provisions of the order, which would certainly prove a great public convenience. It is considered not improbable that the company concerned in the Halesowen light railway proposals, will take up the linking of the Brierley Hill, Quarry Bank and Cradley Heath districts also.

Rochdale.—At the meeting of the T.C. to be held on March 2nd, the members will be asked to sanction an agreement with the Bacup Corporation with respect to the construction, electrical equipment, working and maintenance of the light railway, authorised by the Bacup light railway order of last year. This refers to the tramways extensions which will connect up the Rochdale and Rossendale Valley tramways at Shawforth.

Scarborough.—The residents who supported the local tramway service so badly when it was running are, now that the service has been stopped for the winter months, feeling the loss of the convenience keenly. A deputation of "ratepayers, residents and property owners" waited upon the Town Council this week and voiced their grievance that the trams had stopped, and urged "that the Tramway Co. should be immediately approached with a view to securing, by means of a reasonable compromise, a sufficient service of trams throughout the year." Reference was made to people having built and occupied houses on the outskirts of the town, owing to the convenience of the tramway service, and now that it has stopped, "the increasing number of empty houses in the outlying districts will result in a very considerable loss in rent, rates and depreciation in value of property." At the close of the meeting of the T.C., a committee meeting was held, at which the chairman reported the result of his interview with the B. of T., and it was resolved that application be made to the Board, asking it to make an order determining the powers of the Scarborough Tramways Co., on the ground that the company has discontinued the working of the tramways for a period of three calendar months, and that in the alternative, a representation be also made to the Board that such company is insolvent and unable to work the tramways to the advantage of the public, and that its powers should, for that reason, also be determined.

Swansea.—In connection with the proposed acquisition by the Corporation of the tramway system of the town, a Sub-Committee of the local authority has met the chairman and the manager of the tramways to discuss the general lines of a suggested arrangement whereby the tramways may be taken over. This is to the effect that the Corporation tramways should be operated by the company for a fixed period, the right of compulsory purchase in respect to the company's sections not be exercised during that period, and at the expiration of the term the Corporation is to have the option of taking over the whole of the company's tramways at their constructive value, and the station plant, &c., by valuation. There is a difference between the parties of three or four years in the periods suggested respectively by the company and the Corporation, but an agreement on the lines indicated seems probable.

Torquay.—The Corporation has lodged a petition in Parliament against the Paignton Council Bill. A few months ago there was an element of doubt whether the Torquay Tramway Co. would succeed in raising the money necessary to extend the line to the neighbouring town, and the Paignton Council decided to insert in the Bill it was promoting for water and other purposes, a clause entitling it to construct tramways to the Torquay boundary if thought advisable. The desire of the Council was not to undertake the work, but to place itself in a position to dictate terms to a new company, and thus prevent the exploitation of Paignton. Power to take over the tramways in the event of failure of the company has already been granted to the Torquay Corporation, the authority also having the right of constructing a tramway between the two towns; and should the Paignton Bill be passed as it at present stands, the Torquay Act would, to a certain extent, be nullified. The opposition will probably be pressed unless the Paignton Council consents to withdraw the clauses relating to the tramways. The work of extending the line to Paignton will be commenced within the next month, the material required being on order. It is calculated that the work will be completed by the end of May.

TELEGRAPH and TELEPHONE NOTES.

French Telephones.—Not content with holding the monopolies of matches, tobacco and the service of telegraphs, telephones, railways, &c., the Department of Posts and Telegraphs proposes to appropriate that of the supply of telephone apparatus and appliances. Our contemporary, *l'Industrie Electrique*, devotes an article to this subject, in which it voices the alarm of French manufacturers at this newest departure, and, without mincing matters, bluntly describes the State's conduct of the various businesses it has in hand as a public scandal.

Long-distance Telephony.—A trial is shortly to be made of telephonic communication between London and Amsterdam, Cologne, Frankfort, Basle and Zurich, by way of Paris and some other Continental city.—*Daily Mail.*

Railway Companies and Telegraph Work.—In reply to a question in Parliament, Mr. Herbert Samuel recently stated that the amount paid to railway companies as payment for telegraph work performed by them during 1909 on behalf of the Post Office was £55,510. This amount includes the payments made for delivery of telegrams as well as for transmisssion, but it does not include payment for maintenance of telegraph lines on railways. The railway companies do the work under an obligation imposed upon them by statute.

Telephone Employés.—The Amalgamated Society of Telephone Employés held a meeting on Wednesday last week, "to support the society's claims on its behalf for fair treatment at the transfer of the National Telephone Co.'s concern to the Government." The secretary, Mr. V. G. Jeffreys, pointed out that improvements could be more easily effected under a company than under a Government department, and it was important to remember that the conditions of employment at the time of the transfer would form the basis of the employés' standing under the Government. Their service with the National Telephone Co. should be counted for all purposes as service with the State. The whole of the permanently employed staff of the company should be placed upon the establishment of the Post Office; and the staff should not be subjected to qualifying or elementary examinations as an essential condition for promotion or for any other purpose after the transfer.

Wireless Telegraphy.—The military wireless station at the Eiffel Tower has succeeded in transmitting prearranged, but weak and intermittent, signals to the Glace Bay Marconi station in Canada.

In the Colonial Report on Trinidad and Tobago for 1909-10, it is stated that the wireless telegraph system between Trinidad and Tobago operated without interruption throughout the year, though more trouble was experienced than in previous years from disturbed atmospheric conditions. It is proposed to provide a more powerful transmitting plant next year.

Wireless communication was maintained between the Army airship "Beta" and a company of Royal Engineers at headquarters during a voyage made by the "Beta" from Aldershot to Wallingford and back last week.

Arrangements have now been made whereby wireless telegrams may be received at any postal telegraph office for transmission to ships at sea, when such vessels have passed beyond, or have not yet entered into, the radius of operation of the Postmaster-General's coastal stations. Such telegrams will be charged for at the inclusive rate of 3s. per word. The Marconi station at Poldhu has a range of about 1,500 miles, and should the ship to which the message is addressed have passed beyond this range, the telegram will be forwarded (without extra charge) by telegraph to the Marconi Co.'s long-distance station at Cape Cod, Massachusetts, and thence transmitted to the ship.

CONTRACTS OPEN and CLOSED.

OPEN.

Aberaman.—March 13th. Electrical goods, for the directors of the Powell Duffryn Steam Coal Co., Ltd., 101, Leadenhall Street, London, E.C.; Stores Manager, Aberaman Offices, near Aberdare.

Aberdeen.—March 9th. One 1,000-KW. continuous-current turbo-generator, with surface condenser and air-pump, for the Corporation Electricity Department. See "Official Notices" to-day.

Acton.—February 28th. Supplies, for a year, for the U.D.C. Electricity Department. See "Official Notices" February 17th.

Australia.—March 7th. Eleven sections of a branching multiple magneto lamp-signalling switchboard, for the P.M.G.'s Department in Victoria. See "Official Notices" December 16th.

March 14th.—Installation of wireless telegraphy at Thursday Island and Papua, for the P.M.G. of Australia. See "Official Notices" December 23rd.

May 8th.—Battery of accumulators, with boosters and switchboards, for the Melbourne City Council. See "Official Notices" to-day.

April 18th.—One common-battery switchboard, for the P.M.G.'s Department in Western Australia. See "Official Notices" Dec. 23rd.

March 7th.—10,000 telephone protectors, for the P.M.G.'s Department in Victoria. See "Official Notices" January 13th.

March 8th.—Measuring instruments for the P.M.G.'s Department in Queensland. See "Official Notices" January 20th.

April 4th.—10¾ miles of lead-covered cable, for the P.M.G.'s Department in Victoria. See "Official Notices" February 3rd.

April 19th.—Deputy Postmaster-General, Adelaide. Five motor-generators and one switchboard (Schedule No. 158). A deposit of 5 per cent. on the first £1,000, and of 2½ per cent. on the amount above that sum, will be required with each tender. Local representation is necessary. Specification, &c., on application to the Australian High Commissioner in London, 72, Victoria Street, S.W., where also preliminary deposits may be paid.—*Board of Trade Journal.*

June 14th.—Switchboard, common-battery, multiple, for the P.M.G.'s Department in South Australia. See "Official Notices" February 3rd.

June 14th.—Branching multiple magneto lamp-signalling switchboard, for the P.M.G.'s Department in Victoria. See "Official Notices" February 3rd.

Barnsley.—February 28th. Nut slack, for a year, for the Corporation electricity works: Borough Electrical Engineer.

Barrow-in-Furness.—March 6th. Coal and stores, for the Corporation Electricity Department, for a year. Borough Electrical Engineer.

Beckenham.—March 20th. Meters, for the U.D.C. See "Official Notices" to-day.

Belfast.—February 27th. (*a*) Stores for a year, and (*b*) vulcanised bitumen cables for a year, for the Corporation Electricity Department. See "Official Notices" February 10th.

Belgium.—March 15th. The municipal authorities of Jumet, Belgium, are inviting tenders for a steam engine and dynamo at the central electric lighting station in that town. Particulars can be obtained from the Bureau du Service de l'Electricité, Rue Biernaux, Jumet.

Birmingham.—March 7th. Electrical stores for a year, for the Birmingham, Tame and Rea District Drainage Board; Mr. John D. Watson, Engineer, Drainage Board Offices, Tyburn, Birmingham.

Bolton.—March 6th. Materials and stores, for the Corporation Tramways Department. See "Official Notices" to-day.

Bootle.—March 4th. V.B. wires and cables, electric meters, arc lamp carbons, fuse boxes and terminals, arc lamp globes, compound and bitumen, incandescent lamps, &c., for the T.C., for a year: Borough Electrical Engineer's Office, Pine Grove.

Brighton.—March 6th. One 300-KW. three-phase induction motor-generator, for the Corporation power station, Southwick. See "Official Notices" to-day.

Bristol.—March 7th. Arc lamp carbons, globes, joint and fuse boxes, and A.C. meters, for the Corporation Electricity Department. See "Official Notices" to-day.

Cardiff.—March 1st. Uniforms for tramway men, for the T.C.; Manager, Tramways Department, Central Offices, The Hayes.

Croydon.—February 27th. Electric light sundries, &c., for the Mental Hospital, Warlingham, for the T.C., for a year; Clerk of the Hospital.

March 6th.—Fuse and other boxes, meters, &c., lamp-posts and bracket arms, and feeder pillars, for the Borough Electricity Department. See "Official Notices" February 10th.

Denmark.—March 3rd. The Bronderslev City Electric Works invites tenders for an electric automatic pumping arrangement. Tenders to "Herr Kobmand Tolstrup, Bronderslev Kommunale Elektricitetsvaerk," Bronderslev. Plans and specifications from Herr Jochimsen, engineer, Frydendalsvej 4, Copenhagen, on deposit of 20 kroner (22s. 3d.).—*Board of Trade Journal.*

Dover.—March 2nd. Electrical sundries and cables, for the Harbour Board, for a year; Mr. Martyn Mowll, Registrar of Dover Harbour, 34 and 36, Castle Street, Dover (schedules 2s. 6d. each).

Dublin.—March 6th. 3,000-KW. turbo-alternator, condensing plant, boilers, stokers, steel chimney, pumps, piping, &c., for the Corporation. See "Official Notices" February 10th.

Dundee.—The Corporation Tramways Committee invites tenders for the supply of stores; Mr. P. Fisher, General Manager.

Dutch Indies.—The Government of the Dutch East Indies has just sent a deputation to Padang to investigate the measures necessary to develop the Ombilin colliery, near that town For further particulars see this column last week.

Eccles.—March 20th. One 500-K.V.A. steam engine, single-phase generator and exciter, for the Corporation. See "Official Notices" to-day.

Edinburgh.—March 6th. Electric light installation for new Usher Hall, for the Corporation; Mr. J. A. Williamson, City Superintendent of Works, City Chambers, Edinburgh (returnable deposit of £2 2s.).

March 7th.—Two cooling towers, for the Dewar Place Corporation electricity supply station. See "Official Notices" February 17th.

March 7th.—Extension switchboard, for the Corporation. See "Official Notices" to-day.

Germany.—April 3rd. The Prussian State Railway authorities at Siegen are inviting tenders for the supply and erection of a 25-ton electrically-operated crane.

Govan.—February 27th. One 500-KW. rotary converter, for the Burgh Electricity Department. See "Official Notices" February 17th.

Halifax.—February 28th. One natural-draught chimney-type cooling tower, for the Corporation electricity works. See "Official Notices" February 17th.

Heston and Isleworth.—March 1st. Supplies, for a year, for the U.D.C. Electricity Department. See "Official Notices" February 17th.

Hornsey.—March 6th. Meters, cables, troughing, &c., and distribution, joint and fuse boxes, for the T.C. See "Official Notices" February 17th.

Huddersfield.—The borough engineer has been instructed to obtain tenders for materials necessary in doubling the tramway in Northumberland Street, from Northgate to Leeds Road, constructing a new loop in Ashbrow Road, and making the Newsome Road and Birchencliffe extensions.

Hyde.—March 4th. Vertical three-throw pump with electric motor, for the T.C.; Borough Surveyor.

Ilford.—February 28th. Supplies for a year, for the U.D.C. Electricity Department. See "Official Notices" Feb. 17th.

India.—March 9th. Four electrically-driven centrifugal pumps, for the Cossipore station of the Calcutta Electric Supply Co., Ltd. See "Official Notices" February 17th.

Keighley.—For supplying iron plates, grids, ladders, hand-railing, &c., in connection with new turbines, condensing plant and steam piping. Specifications from the borough electrical engineer.

London.—MARYLEBONE.—March 15th. (Amended notice.) Supplies, for a year, for the B.C. Electricity Department. See "Official Notices" to-day.

FULHAM.—March 1st. Stores for a year, for the B.C. Electricity Department. See "Official Notices" February 17th.

HAMMERSMITH.—March 8th. Water-tube boilers, with superheaters, forced draught furnace, with mechanical stokers, economisers, &c., for the B.C. See "Official Notices" February 17th.

L.C.C.—March 15th. Electrical installation at the Trade School for Girls, Belvedere Place, S.E. See "Official Notices" to-day.

March 2nd.—The Commissioners of H.M. Works and Public Buildings are inviting tenders for the erection of the Western Telephone Exchange. Specification, &c., from Mr. J. Rutherford, 22, Carlisle Place, S.W.

Manchester.—February 27th. General stores for the Corporation Tramways Department. See "Official Notices" February 10th.

March 7th.—The Great Central Railway Co. are inviting tenders for electric light fittings and telegraph material. Specifications, &c., from Mr. Walter Williams, Stores Superintendent, Great Central Railway, Gorton, Manchester. Tenders are required for the supply for one year, and alternatively for two years.

Middleton.—March 8th. Barometric jet condenser, for the Corporation Electricity Department. See "Official Notices" to-day.

Newport (Mon.).—March 7th. Electric light fittings, for the B. of G.; A. H. Rees, Clerk, Queen's Hill.

New Zealand.—March 22nd. The New Plymouth B.C. is extending its plant and adding two 250-K.V.A. 6,600-volt 50-cycle single-phase alternators, driven by water turbines; a 30-KW. exciter, 100 to 125 volts; a 45-H.P. single-phase induction motor, and switchgear.

Norway.—March 1st. H.M. Consul at Christiania reports that tenders are invited for the supply to the Christiania Municipal Electric Works Administration of cables and smooth copper wire. Sealed tenders, marked "Anbud paa Kabler," to "Elektricitetsverkets Kontor, Raadhusgaten Nr. 19," Christiania. The cables must be delivered in such lengths that each drum does not exceed 3 tons. Tenders, which must contain an express acceptance of the terms of the conditions of tender, must quote prices, free quay or railway station Christiania, inclusive of import duty, in Norwegian currency, (*a*) for the cables per 100 metres, inclusive of loan of cable drums (to be delivered back f.o.b. steamer), and (*b*) for copper wire per kilogramme. Samples must accompany tenders. A copy of the conditions of tender, &c., may be seen at the Commercial Intelligence Branch of the Board of Trade.

Partick.—March 6th. Materials, for a year, for the Burgh Electricity Department. See "Official Notices" to-day.

Walsall.—March 7th. Purchase and removal of obsolete plant at the Corporation electricity works. See "Official Notices" to-day.

Walthamstow.—February 24th. Stores for a year, for the U.D.C. Electricity and Tramways Departments. See "Official Notices" February 3rd.

York.—March 14th. 1,000-KW. turbo-generator and condensing plant, transformers and switchgear, water-tube boiler, feed pumps and pipework, for the Corporation. See "Official Notices" to-day.

CLOSED.

Australia.—An Australian exchange states that the Mines Department at Victoria has placed with the Australian General Electric Co. a contract for electrical machinery for Powlett State coal-mine, at £26,700.

Dublin.—Messrs. Wm. Coates & Sons have secured the contract for the electric lighting of the whole of the new and old buildings at the Richmond Asylum, including the Grangegorman annexe. Over 2,000 lights are to be installed, and the current will be taken from the Dublin Corporation mains. Mr. Thomas Tomlinson is the consulting engineer, and has specified the use of twin paper-insulated lead-covered wiring.

East Ham.—The T.C. has accepted the tender of Messrs. Baxter & Caunter, at £106, for switchboard extensions at the generating station.

Fleetwood.—Messrs. Dick, Kerr & Co., Ltd., are supplying a new balancer-booster set for the electricity works, at £165.

Glasgow.—The T.C. Committee on Tramways, Works and Stores recommends the acceptance of the following:—

Porcelain switches and cut-outs.—Edison & Swan United Electric Light Co., Ltd.
Bell-pushes.—Falk, Stadelmann & Co., Ltd.
Block tin.—T. B. Campbell & Sons, Ltd.

The offer of the Bell Punch and Printing Co., London, to supply not more than 500 punches on hire to the Corporation, at the rate of 10s. per punch per annum, inclusive of maintenance, has been accepted.

Mr. Alex. Lindsay, Glasgow, has secured the contract for improving the electric lighting of Kingston Library, his offer, which was the lowest, being £26.

Government Contracts.—The following tenders have been accepted during the past month by the Government Departments named:—

ADMIRALTY, CONTRACT DEPARTMENT.

Incandescent lamps.—General Electric Co., Ltd.; British Thomson-Houston Co., Ltd.

WAR OFFICE.

Incandescent electric lamps.—British Tungsten Lamp Co., Ltd.; Edison and Swan United Electric Light Co., Ltd.; Siemens Bros.
Wiring of barrack blocks and W.D. buildings for electric light, Curragh.—Edmundson's Electricity Corporation, Ltd.

INDIA OFFICE, STORE DEPARTMENT.

Coils.—Marconi's Wireless Telegraph Co.
Wireless telegraph apparatus.—Marconi's Wireless Telegraph Co.

CROWN AGENTS FOR THE COLONIES.

Telegraph poles.—Siemens Bros. & Co., Ltd.

GENERAL POST OFFICE.

Bell sets.—International Electric Co.
Magneto bells.—British L. M. Ericsson Manufacturing Co., Ltd.
I.R. and C. core cable.—British Insulated and Helsby Cables, Ltd.: Henley's Telegraph Works Co., Ltd.
Loop cable.—Western Electric Co., Ltd.
Paper-core cable.—British Insulated and Helsby Cables, Ltd.; Callender's Cable and Construction Co., Ltd.; Johnson & Phillips, Ltd.
Cases for retardation coils and condensers.—British L. M. Ericsson Mfg. Co., Ltd.
Loading coils.—Western Electric Co., Ltd.
Retardation coils.—Western Electric Co., Ltd.
Flexible cords.—London Electric Wire Co. & Smiths, Ltd.; Peel-Conner Telephone Works, Ltd.
Electric fans.—Matthews & Yates, Ltd.
Pole steps.—Bullers, Ltd.
Bell receivers.—British Insulated and Helsby Cables, Ltd.
Watch receivers.—International Electric Co.
Switchboards.—British Insulated and Helsby Cables, Ltd.; British L. M. Ericsson Mfg. Co., Ltd.; Western Electric Co., Ltd.
Telephones.—British Insulated and Helsby Cables, Ltd.; British L. M. Ericsson Mfg. Co., Ltd.

OFFICE OF WORKS.

Electric lifts, Marlborough House.—Otis Elevator Co., Ltd.

Hornsey.—The B.C. has accepted the tender of J. W. Carpenter, Ltd., for the supply and installation of an electric motor, &c., at the Sanitary Depôt, at £57.

Horsham.—Messrs. Venner & Co. have received the contract for 5-amp. Chamberlain & Hookham meters for the ensuing 12 months.

Ilford.—The U.D.C. has accepted the tender of Messrs. E. Foster & Co. for 8,000 tons of Ibstock Medium Peas coal for the electricity works, at 11s. 10d. per ton.

Littleborough.—The Electricity Committee of the U.D.C. has accepted the following tenders :—

General Electric Co.—Supply of new lamps.
W. T. Henley's Telegraph Works Co.—Fixing meters and testing service mains.

London.—SOUTHWARK.—The B.C. has placed an order with the Lancashire Dynamo Co. for a 20-H.P. motor, at £40.

L.C.C.—For 23, Belvedere Road, firms quoted for five smiths' hearths as follows :—

Geo. Hatch, Ltd.	£15 10*	each, less 2½ %
Standard Engineering Co., Ltd. ..	(accepted) £15 5	"
Sturtevant Engineering Co., Ltd.	£24 18	"

* Not according to specification.

STEPNEY.—A contract for 50 tons of moulded pitch, for the Electricity Department, has been placed with Messrs. Grindley and Co., Ltd., of Poplar, at 40s. per ton.

Lowestoft.—The T.C. has accepted the following tenders :—

Callender's Cable and Construction Co.—Paper-insulated cable.
India-Rubber, Gutta-Percha & Telegraph Works Co., Ltd.—Service cables.
Messrs. Mansfield.—Earthenware troughing with tiles and bridges for mains, 7¾d. per yard.

Rawtenstall.—The tender of Messrs. Siemens Bros. and Co., Ltd., for high-tension switchboard extension, has been accepted by the Corporation.

Richmond-on-Thames.—The District Council has accepted the tender of Messrs. Beard & Co., at £50, for substituting electric light for gas in the swimming-baths and fitting up twenty-four 100-C.P. incandescent lamps.

Sandown.—The Council has accepted the tender of Messrs. Stuart & Moore for electric fire alarms, at 14 half-yearly payments of £7 4s.

Swindon.—The T.C. has accepted the tender of the Tudor Accumulator Co., Ltd., for additional plates for batteries, at £136.

The Corporation has purchased a number of tramcar meters from Messrs. Chamberlain & Hookham, who will also maintain them for five years.

FORTHCOMING EVENTS.

Association of Mining Electrical Engineers (Inc.) (South Wales Branch).—Saturday, February 25th. At 5 p.m. At the Park Hotel, Cardiff. Papers on "Oils for Transformers and Switches," by Mr. G. W. Humphry; and "Three-Phase Motors for Haulage in Mines," by Mr. Jas. Simpson.

Newcastle Branch.—Saturday, February 25th. At 2.30 p.m. At the Armstrong College. Papers on "Electricity in New South Wales Collieries," by Mr. E. Kilburn Scott; "Oils for Transformers and Switches," by Mr. G. W. Humphrey; and "Considerations specially relative to Small Colliery Installations," by Mr. T. Thomson.

Manchester Association of Engineers.—Saturday, February 25th. At 7.30 p.m. At the Grand Hotel, Manchester. Paper on "Large Gas Engines," by Mr. A. E. Chorlton.

Association of Engineers-in-Charge.—Saturday, February 25th. At 3 p.m. Visit to the Surrey Commercial Docks, Rotherhithe, S.E.

Institution of Civil Engineers.—Tuesday, February 28th. At 8 p.m. Paper on "Modern Railway Signalling: Some Developments upon the Great Western Railway," by Mr. A. T. Blackall.

Royal Institution.—Saturday, March 4th. At 3 p.m. Lecture on "Radiant Energy and Matter," by Prof. Sir J. J. Thomson. (Lecture I.)

Junior Institution of Engineers.—Saturday, March 4th. At 3 p.m. Visit to the London County Council's Greenwich generating station.

Institution of Engineers and Shipbuilders in Scotland.—Saturday, March 4th. At 7 p.m. At the Grosvenor Restaurant, Glasgow. Smoking concert.

THE ELECTRICAL ENGINEERS
(LONDON DIVISION).

THE following orders are issued :—

Commanding Officer—COL. H. M. LEAF.

Monday, February 27th.—"A" Company. Technical drill, 7 to 10 p.m.
Tuesday, February 28th.—"B" Company. Technical drill, 7 to 10 p.m.
Thursday, March 2nd.—"C" Company. Technical drill, 7 to 10 p.m.
Friday, March 3rd.—"D" Company. Recruits' infantry drill, 6.30 to 7.15 p.m. Technical drill, 7.15 to 10 p.m.
Saturday, March 4th.—At 7.30 p.m. Social Club Cinderella Dance at Caxton Hall, Westminster.

(Signed) P. H. CAMPBELL, Capt. R.E., Adjutant.

Appointments Vacant.—Charge engineer for the Avonmouth sub-station of the Bristol Corporation (30s.); temporary draughtsman, for the York Corporation electricity works (£2 2s.); manager, for the Keighley Corporation Tramways (£175). See our advertisement pages in this issue.

NOTES.

What's Wrong with the Colleges?—"A University Lecturer" writes as follows :—

"The story which was related in a bantering fashion has apparently been taken very seriously. Under the circumstances you will probably permit me to express regret and an apology to Prof. Kapp for any pain which it may have caused him. Similar stories are, of course, current about many other Institutions. It was never intended to single out the Birmingham undergraduate (who is remarkably energetic and well trained) for scorn. It was the lack of discipline due to the existing system, and *not* individuals, who were attacked. The argument was in favour of enforcing greater discipline at colleges. After reading the letter in your issue last week, I was sorry that, in order to emphasise an argument, I used an illustration told me in all good faith by people connected with the place. That Prof. Kapp's influence has been all on the side of improvement, goes without saying."

Bonus for Rhondda Tramway Men.—A large meeting of the whole of the Rhondda Tramway Co.'s employés who were off duty was held on Tuesday, 14th inst., at the Tynywydd Hotel, Porth, when Mr. H. J. Nisbett, general manager and engineer, informed the men that the directors at their meeting had decided, as a mark of their appreciation of the manner in which the staff and the employés generally had carried out their duties, to present each man who had been in their employ for a complete year with a week's wages as a bonus, based on the average amount paid to each man for the past year. This was a very handsome present considering the loss to traffic which had been caused by the strike of the colliers, and it amounted to nearly £250. Mr. Geo. E. Roddy, traffic manager, proposed a very hearty vote of thanks to the directors for the handsome present, and said he hoped the whole of them would endeavour to do better in the future than they had even in the past, for their company, to show their gratitude and appreciation of the generous manner in which they were treated by their employers, for as far as his experience went this action was quite unique in tramway work. Mr. H. Welsh, president of the men's union, seconded the vote of thanks on behalf of the men who, he was sure, would not forget such generous treatment. A smoking concert followed.

Parliamentary.—*Petitions.*—Petitions have been lodged in the House of Lords against the following Bills :—Brighton District Tramways; Brighton, Hove and District Railless Traction; Middlesbrough, Stockton-on-Tees and Thornaby Tramways; Oldham and Saddleworth District Railless Traction; Croydon and Southern District Railless Traction; Macclesfield and District Railless Traction; Matlock District Railless Traction; Western Valleys (Mon.) District Railless Traction; Winchester Corporation (Electric Power); Bristol Tramways; Central London Railway; London County Council (Improvements and Tramways) Bill; London Electric Railway; Metropolitan District Railway; Metropolitan Electric Tramways; Metropolitan Railway; Nottingham and Derbyshire Tramways; Rotherham Corporation; Rotherham and District Railless Traction; South Lancashire Tramways; the Greater London Railway (opposed by over 20 different bodies).

Electricity in Mines.—Mr. Wedgwood asked the Home Secretary whether he proposed to introduce legislation based on the report of the Departmental Committee on the Use of Electricity in Mines, and if so, when.—Mr. Churchill replied that it would not be necessary to introduce legislation. The rules proposed by the Committee could be established as special rules under the procedure provided by the Mines Regulation Acts, and he would consider whether steps for this purpose could be taken at once.

London County Council Tramways Bill.—On Friday of last week the Bill promoted by the L.C.C. for tramway purposes was down for hearing by the Examiners of Standing Orders as an "opposed" measure. An application was made for an adjournment till March 2nd, which was granted. It is understood that the opposition is on the ground of not having obtained the "consents" of certain road authorities.

In the House of Lords, on February 15th, the following Bills were read a second time :—Malvern Electric Traction Bill, Matlock District Railless Traction Bill, and Winchester Corporation (Electric Supply) Bill.

In the House of Commons on Monday, the Metropolitan District Railway Bill was read a second time.

Electrical Trades Benevolent Institution.—It has been decided to hold this year's Festival Dinner on April 26th, at the Hotel Cecil. The secretary informs us that the association has recently had to deal with several cases, and it is sincerely hoped that the electrical trade generally will give it their very full support, so as not only to enable it to carry out the granting of temporary relief, but to place it in such a position as will enable it to grant pensions to its qualified members or their widows. This, it must be borne in mind, is its main object.

Hackney Electric Rifle Club.—The club held their first annual prize distribution and smoking concert on February 10th at the Town Hall, Hackney, before a representative gathering. The chairman of the Electricity Committee presided, and was supported by the ex-Mayor and the vice-chairman of the Committee. Amongst the visitors were Mr. John May and Mr. Spencer Hawes, the former having presented the club with a handsome challenge cup. The programme was a lengthy one, and

of a first-class character, each item being keenly appreciated. The prizes (22 in number) were distributed by the ex-Mayor. Further cups were promised to the club by Mr. L. L. Robinson (president) and Mr. Horatio Bottomley (M.P. for the division). The club is anxious to arrange matches with any similar rifle club, either metropolitan or provincial. Address: E. Mathews, Electricity Works, Millfields Road, Clapton, N.E.

Institution and Lecture Notes.—Institution of Electrical Engineers (Newcastle Local Section).—The annual dinner of the Section was held in Newcastle-on-Tyne on the 17th inst., Mr. C. Faraday Proctor, chairman, presiding. After the loyal toasts had been honoured, Mr. E. Box (President of Newcastle Students' Section Inst. C.E.) proposed the "Institution of Electrical Engineers." Mr. Ferranti, in reply, said that that Section, though by no means the largest of the local sections, was particularly interesting when one thought of the position which that district had occupied in regard to electrical progress. Many years ago, as they knew, Sir Joseph Wilson Swan belonged to that district; he was really the first man in this country who gave a great impetus to the era of electric lighting. It was such a long time ago since he invented and perfected his incandescent lamp that they were apt to forget what that work meant; they had only to go back some years to that period, and think of the difficulties that were involved in electric lighting work, to see what an immense debt the public at large owed to Mr. Swan. Then later on they came to the wonderful work which had had such far-reaching effects in this country, and all over the world; he referred to the invention by the Hon. Charles A. Parsons of the steam turbine. To mention another instance, there was the wonderful developments of electrical distribution and the application of electricity to all sorts of purposes by Mr. Merz and the engineers he had associated with him in that great work. Notwithstanding all that had been done, it was hard to realise what a very small amount of electrical work we had secured in relation to the immense electrical requirements of the future. As many of them knew, he had spoken of the application of electricity to all purposes where coal was now employed. He believed that when we had made one development after another, perfected this process and that, we should reach a time when we should get such a great return of electricity for the coal we turned into energy of this form, that on account of its ease of application it would be more economical to use the whole of our coal for generating electricity rather than use it directly as we did now.—The chairman also replied.—Mr. Gerald Stoney proposed "Armstrong College, Learned Societies and Guests," and Prof. Weighton responded.

Institution of Post Office Electrical Engineers.—The fifth ordinary meeting of the Metropolitan Centre was held at the Institution of Electrical Engineers on the 13th inst., Major W. A. J. O'Meara, C.M.G., R.E., in the chair. Mr. E. W. Pettit read a paper on "Conveying Systems," with special reference to their adaptability for use in Post Offices. The authorities of the Post Office have been considering this matter and making experiments in connection therewith for some time past, and there is not much doubt that every effort will be made to install conveyors in the future. During the discussion which followed, Mr. H. C. Gunton, principal power engineer to the Post Office, stated that he had visited most of the principal towns in the United Kingdom with a view to seeing whether conveyors could be suitably employed in their respective Post Offices.

South African Institute of Electrical Engineers.—At the second annual general meeting on January 19th, it was reported that the membership of the Institute was 205. Mr. J. H. Rider was elected President.

Junior Institution of Engineers.—A paper was recently read on "Condensing Plants," by Mr. G. L. Kothny, before the Junior Institution of Engineers. The author, who has made an exhaustive study of his subject, spoke chiefly about modern air pumps, realising that with the high vacua now demanded, this part of the plant is of supreme importance. He expressed the opinion that rotary auxiliaries will rapidly supplant reciprocating sets, as the turbine is doing in main units. Tables were shown which clearly indicated that the rotary air pump can compete favourably with the most modern reciprocating types, and obtain better results in the higher range of vacua, combined with maximum simplicity, there being only one rotary wheel, and all valves eliminated.

Royal Institution.—On Saturday, March 4th, Prof. Sir J. J. Thomson commences his course of six lectures on "Radiant Energy and Matter." The Friday evening discourse on March 10th will be delivered by the Hon. C. A. Parsons on "Recent Advances in Turbines."

At a meeting of the Leeds University Textile Students' Association last week, Mr. G. D. A. Parr delivered a lecture on "Electricity as the Motive Power in Textile Works." The President, Mr. A. G. Lupton, remarked upon the great increase that was taking place in the use of electricity by the textile industries in the district. The textile trade was by far the best class of customer the Yorkshire Electric Power Co. possessed, and the business done had increased during the past year by 50 per cent.

"Some Recent Applications of Electricity" was the subject of a paper read at Glasgow last week by Mr. W. Benison Herd, under the auspices of the I.C.S. Students' Association.

Staff Dinner.—On Friday last, 17th inst., the members of the staff of the Anchor Cable Co., Ltd., held their seventh annual staff dinner at the White Horse Hotel, Leigh, about 35 members and guests being present. After dinner a smoking concert was held, and in the unavoidable absence of Mr. James Callender, Mr. J. Bowyer, the works manager, took the chair. During the evening the usual toasts were given, and the chairman, in proposing the toast of the Anchor Cable Co., remarked that the past year had undoubtedly been the most successful in the annals of the company. He also took the opportunity of thanking the staff for their services. A capital programme, consisting of pianoforte selections, songs and recitations, was rendered by Mr. Walter Darlington's party.

Substitute for Radium.—It is reported from Berlin that Prof. Otto Hahn, of Berlin University, has succeeded in obtaining an effective substitute for radium, and in a few months' time the Academy of Science will be in possession of 250 milligrammes of it, which it will lend out to investigators. The new radio-active matter is a by-product of the manufacture of thorium gas mantles, and has been named by its discoverer "mesothorium." In combination with bromine it is a white salt with the same radio-active properties as the corresponding salt of radium, though the latter costs three times as much. It is stated that Germany alone can produce ten grammes of mesothorium salt in a year, or as much as the entire world's present supply of radium salt.

Birmingham Electric Club.—The second annual dinner of the Birmingham and District Electric Club was held at the Colonnade Hotel on Saturday evening last. The toast of "The Club" was submitted by Mr. G. O. Donovan, who remarked that since its formation seven years ago, much good work had been accomplished, especially in connection with the reading of papers with which helpful discussions were always associated. The President (Mr. F. W. Foster), who occupied the chair, responded in a humorous speech, and said he liked to look upon the club as a secondary school for unconscious education. Mr. T. H. Hunter proposed "The City of Birmingham." Mr. W. E. Milns, who replied, described the growth of the city electrical undertaking, and remarked that, apart altogether from the business side of the enterprise, the department, by bringing about conditions which no legislation in the shape of Factory Acts could establish, was doing something that was of considerable benefit to the community. Other toasts honoured included "The Electrical Industry," proposed by Mr. G. T. Wood, and responded to by Mr. W. H. Whitehouse, and "The Visitors," proposed by Mr. John J. Inniss, responded to by Mr. W. Y. Anderson and A. Harley. Among the contributors to the musical programme were Messrs. E. H. Stack, R. W. Perry, F. N. Dowling and George Street, Mr. W. E. Longmore playing the accompaniments.

Chelmsford Electricals.—The Chelmsford Electricals held their annual Bohemian Concert on Friday last, at the Shire Hall, Chelmsford, with Captain H. W. Trefusis in the chair. There was a large gathering, in fact, nearly 200 people were present, including the Mayor of Chelmsford, and officers from most of the other local Territorial units. The concert was a great success, and if the Chelmsford Electricals know as much about manning and working searchlights as they seem to know about running a concert, then they are well on the way to being a very efficient corps.

Metal-Filament Lamp Tests.—The Westminster Electrical Testing Laboratory has just completed a series of life tests on 15 of the principal makes of metal-filament lamps. Four lamps of each make were tested: they were ordered direct from the makers, and purported to be of 25 c.p. and for 200 volts. The lamps were run at 200 volts on an automatically regulated circuit for 2,000 hours, and were tested every 200 hours. The results of the tests have been printed in full, and are ready for distribution to subscribers.

Train Lighting.—As briefly mentioned in our last issue, the collision which occurred at Courville, on the Western State Railway of France, on February 14th, was followed by the bursting of the gasoline tanks, and a fire, which rapidly spread from coach to coach, consuming the two trains. Some of the bodies of the dead were burned beyond recognition. Such fires are almost inevitable so long as gas is used instead of electricity for lighting trains.

A train fire is also reported from Russia, due to the ignition of oil; seven passengers were burnt to death.

Horse Killed by Electricity.—The *South Wales Daily Post* reports that at Sketty, in Mr. Hoskins's Yard, there is a sawmill which is driven by a motor. On Friday morning a considerable leakage of electricity was noticed, and Mr. Hoskins left the yard in order to report the matter. The ground around, however, apparently became charged. In Mr. Hoskins's absence, a driver drove a horse and cart into the yard. The animal at once became restive, and as it approached the motor it became unmanageable and began to jump and dance about, until at length it fell down dead.

Altering a Meter Index.—On a summons by the Leyton District Council, Hugh Cautley was fined 40s. and costs for altering the index of an electric meter.

The Lighting of the Crystal Palace and Grounds.—At a meeting of the South Suburban Gas Co. the other day, the chairman remarked in connection with the Festival of Empire at the Crystal Palace, that his company had undertaken to light the grounds of the Palace and about one-half of the Palace itself with over 200 high-pressure incandescent gas lanterns of from 1,000 to 4,500 c.p. each. The other half of the Palace was not included in their tender, and that would be lighted by electricity, which would enable the public to compare the two illuminants.

Dinners.—Last week the annual dinners of the Post Office Engineering Department, London, and the Institution of Electrical Engineers London Students, took place. Owing to pressure on our space, the reports are held over to next week.

Ironclad Switches.—A correspondent asks for the name of a firm who supply ironclad switches that comply *absolutely* with the following conditions:—"The switches to be double pole, enclosed in cast-iron weatherproof case, the operating handle being at the side. The switches must be *guaranteed* to comply with the requirements of the Institution of Electrical Engineers and the Home Office; in other words, they must be capable of standing up against a test of 50 per cent. excess in voltage and 50 per cent. excess in current at one and the same time, with the boxes earthed when the test is applied. It should be borne in mind that on a three-wire system the neutral may be earthed, so that an arc from the live metal to the iron box would be equivalent to a short on one side of the system."

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the ELECTRICAL REVIEW *posted as to their movements.*

Central Station Officials.—The proposal to increase the salary of the Bradford city electrical engineer and manager, MR. THOMAS ROLES, came before the City Council last week, and some opposition was met with. The recommendation, as previously stated, was for the salary to be increased from £600 to £700 per annum, with further advances of £50 in each of the two succeeding years. Mr. Glyde, a Socialist member, moved that the minute be referred back to the Committee concerned for further consideration. He said Mr. Roles was appointed in 1904 as chief assistant at a salary of £250. In 1907 he was elevated to the position of engineer at £450, and subsequent increases brought it to £600. The resolution was defeated, and the advance was accordingly granted.

The General Purposes Committee of the Rawtenstall Town Council recommends that the salary of MR. C. E. L. STEWART, electrical engineer and tramways manager, be increased by £50, and £25 per annum for four years until the salary reaches £350.

MR. D. M. W. HUTCHISON, A.M.I.C.E., B.Sc., formerly with the Lancashire Electric Power Co., and at present power house superintendent at the Dolgarrog works of the Aluminium Corporation Ltd., is resigning the latter post to take up an appointment as assistant electrical engineer in the P.W.D. of the Federated Malay States. He sails in March.

A Special Committee of the Oldham T.C. has recommended that the salary of the borough electrical engineer (MR. NEWINGTON) be increased from £400 to £450 per annum, by two annual instalments of £25.

The Barnes Electricity Committee has recommended the Finance Committee to give an increase of £10 per annum each to the assistant engineer, the first shift engineer and the second shift engineer. It further suggests that the maximum salary for shift engineers be £160 per annum.

At the end of last month the second annual dinner of the combined staffs of the Urban Electric Supply Co. at Newton Abbot and Dartmouth, was held at the Commercial Hotel, Dartmouth; MR. G. E. SMITH, the resident engineer and manager, occupied the chair. Loyal and other toasts were put, that to the chairman being very enthusiastically received, and accorded musical honours. The remainder of the evening was spent in harmony, practically every member of the staffs contributing.

On Friday, February 17th, at the Corporation Electricity Works, Taunton, MR. T. G. BABB was presented with a travelling clock on the occasion of his leaving to take up an appointment with the General Electric Co., Ltd. The presentation was made by the borough electrical engineer, Mr. A. J. Howard, on behalf of the staff.

MR. L. B. HOGARTH, electrical engineer at Morecambe, has had his salary advanced by £25 per annum.

Tramway Officials.—MR. ELI MURGATROYD, the tramways manager to the Keighley Corporation, has handed in his resignation, which has been accepted by the Tramways Committee. Mr. Murgatroyd has been connected with the tramways department for five years, and has held the position of manager for the past 18 months; but he has been in the service of the Corporation altogether for about 17 years. It is understood that he is leaving to take up another appointment at Liverpool.

The Southampton Tramway Committee has recommended that the salary of MR. C. G. SIMPSON, traffic superintendent, be increased from £200 to £220 per annum, rising by £10 per annum to £250.

The Ashton-under-Lyne T.C. has been recommended to appoint MR. HOLT, chief clerk in the tramway offices, as manager of the tramways.

General.—The *Australian Mining Standard* says that no permanent appointment has yet been made of a successor to Mr. H. W. Jenvey, chief electrical engineer in Victoria of the Postmaster-General's department, but in the interval the duties of the position will be fulfilled by MR. A. A. DIREKS, M.I.E.E., of the West Australian branch.

MR. WILFRID ROBSON has been appointed to the position of sales manager in the London office of the Jandus Arc Lamp and Electric Co., Ltd.

MR. JOHN W. F. WARREN has severed his connection with the firm of Warren, Beattie & Co., Ltd., of Middlesbrough. He is at the moment disengaged, but is open to consider proposals from firms individually, or in combination, for foreign travel. Mr. Warren is a native of Smyrna, Turkey, and knows the language spoken in that part of the world.

A portrait of SIR W. CROOKES, foreign secretary of the Royal Society, painted by Mr. E. A. Walton, has been presented to the Royal Society, and it will hang on the wall of the Society's room in Burlington House. The presentation took place on 16th inst., Prof. Meldola acting for the subscribers. Sir William, in responding, remarked that it was nearly 50 years since the Society conferred its Fellowship on him.

The *Australian Mining and Engineering Review* states that MR. JAMES S. FITZMAURICE, assistant electrical engineer at the G.P.O., Sydney, has been appointed chief electrical engineer at the G.P.O., Perth.

An Australian exchange states that MR. E. B. BROWN has been appointed to the position of lecturer in electrical engineering at the Melbourne University.

The *Times* reports that SIR WILLIAM H. WHITE has been awarded the John Fritz medal for 1911, for "notable achievements in naval architecture," remarking that this is recognised as the highest distinction which American engineers can bestow.

The *Times of India*, of January 23rd, publishes a paragraph from its correspondent at Bangalore, as follows:—"Some doubt has been entertained lately as to whether MR. H. P. GIBBS, the chief electrical engineer to the Mysore Government, would continue to supervise the work of the Bombay Hydro-electric Scheme. It is now stated that a rearrangement as to the placing of his services has been made between the Government of Mysore and the new company, and it has been definitely settled that Mr. Gibbs will undertake the duties of the new appointment offered him. Mr Gibbs, however, under the arrangement will pay occasional visits to Mysore to keep in touch with the work being carried out by the Maharajah's Government until his successor in Mysore is appointed."

According to a Reuter dispatch SIR W. H. PREECE has been speaking at a meeting of the Chemical and Metallurgical Society at Johannesburg. He is reported as expressing the firm belief that Johannesburg was the central position of electrical enterprise and energy in the Empire. Sir William also criticised the methods of British manufacturers, who were, he said, difficult to move. He compared them unfavourably with Americans.

The *Australian Mining Standard* states that Mr. L. K. Logan having retired from the position of engineer-in-chief of the New Zealand Government Telegraph Department, MR. J. ORCHISTON has been appointed as his successor.

MR. O. H. BISHOP, until recently a director of the E.M.F., Ltd., has accepted the post of manager for the Edison & Swan Co. of their Manchester district. He takes charge of the new and extended premises at 127, Portland Street, now being opened to cope with the company's increased business in that area. It will be recollected that Mr. Bishop was for many years prominently connected with the company.

Obituary.—MR. JOSEPH WETZLER.—Just as we go to press we learn, with very deep regret, of the painfully sudden death of Mr. Joseph Wetzler, M.I.E.E., M.A.I.E.E., which occurred at Bayswater on Wednesday, after only a few hours' illness. Mr. Wetzler had a host of friends on both sides of the Atlantic. Many of us remember him in his prominent editorial connection with the American electrical Press. In recent years he has been actively engaged in this country as president of the Electrical Engineer Institute of Correspondence Instruction.

CITY NOTES.

Bastian Meter Co., Ltd.

THE directors report that for the year ending December 31st, 1910, the trading again shows an increase as compared with last year. They have written off patents and goodwill £600, and the net amount of profit for the year is then £723, plus £415 brought forward, making £1,139. The payment of the 6 per cent. dividend on the cumulative preference shares, amounting to £121, and a 3¾ per cent. dividend on the ordinary shares, amounting to £372 for the year ending December 31st, 1910, are recommended, and £646 is to be carried forward.

The annual meeting was held on February 16th at the Inns of Court Hotel, Mr. J. W. Salisbury presiding. The report was adopted. The increase in business, as compared with 1910, was due to the steadily increasing sales of the new pattern Bastian meter.

Companies Struck off the Register.—The following companies have been struck off the register, and are accordingly dissolved:—

Conduits and Fittings, Ltd.
General Electric Inspection Co., Ltd.
International Telescriptor Syndicate, Ltd.
Light and Heat Co., Ltd.
Shippey Bros., Ltd.
Simplified Underground Conductor Co., Ltd.
Telephone Bell Push Syndicate, Ltd.

Charing Cross, West End and City Electricity Supply Co., Ltd.

IN their report for 1910 the directors record their regret at the recent death of Mr. G. H. Brougham Glasier, who had been a member of the board for the past 18 years. They consider the results of the year's working to be satisfactory.

West-end Undertakings.—The gross earnings of these undertakings from sales of current, rents, &c., were £142,675, as compared with £142,431 in 1909; the expenses, including depreciation, were £83,688, as compared with £90,252; and the net earnings were £58,988, as compared with £52,179. After bringing in the balance of £5,163 from 1909, and £1,633 for interest accrued in 1910, and paying interest on the debenture stock, there is a balance on net revenue account of £46,954, out of which have been paid the dividend for the year on the preference shares, amounting to £18,000, and an interim dividend for the first half-year at the rate of £5 per cent. per annum on the ordinary shares, amounting to £10,000; leaving a balance of £19,954. The directors recommend that a final dividend be paid on the ordinary shares for the second half-year at the rate of £5 per cent. per annum, making £5 per cent. for the whole year, absorbing £10,000, and that there be carried forward £9,954, as against £5,163 carried forward last year. The company has now connected to its West End mains a total equivalent of 629,381 8-C.P. (or 30-watt) lamps. The total is made up as follows:—437,822 in lighting, 17,242 in heating, and 172,947 (6,918 H.P. = 5,188 KW.) in motive power, and 1,370 bulk supplies.

City Undertaking—The gross earnings of this undertaking from sales of current, rents, &c., were £141,476, as compared with £139,187 in 1909; the expenses were £82,741, as compared with £82,628; and the net earnings were £58,735, as compared with £56,558; after bringing in the balance of £13,289 from 1909, and paying interest on the debenture stock, loans and advances, there is shown a balance on net revenue account of £41,576, out of which has been paid the dividend on the preference shares amounting to £18,000, leaving to carry forward £23,576, as compared with £13,289 in 1909. The company has now connected to its City mains the total equivalent of 564,169 8-C.P. (or 30-watt) lamps. The total includes 310,761 in lighting, 38,142 in heating, and 201,966 (8,078 H.P. = 6,059 KW.) in motive power, and 13,300 in bulk. The chief engineer certifies that the plant and machinery at the several stations of the company have been maintained in a high state of efficiency. With a view to giving effect to the Electric Supply Act of 1908 and 1909, and of advancing and protecting the interests of undertakers, a Joint Committee of Conference, consisting of representatives of companies and local authorities, has been formed. Mr. H. C. Pulley, a member of the firm of Messrs. Laurie, Milbank & Co., 31, Threadneedle Street, E.C., has been appointed a director of the company in place of the late Mr. G. H. Brougham Glasier.

	West-end undertakings.	City undertaking.
Units generated	7,352,118	29,133,647
Units bought	11,797,117	2,176,721
Units sold—Public lamps	430,331	—
Other sales	13,366,119	—
Total B.T. units sold	13,796,450	25,910,610
Used on works, and transmission and distribution losses	5,352,785	5,399,758
Total accounted for	19,149,235	31,310,368
Public lamps	166	—
Total max. supply demanded, KW.	6,446	12,265

Kensington and Knightsbridge Electric Lighting Co., Ltd.

THE directors report that the renewal and reserve fund account now stands at £96,084, being an increase of £10,620 over the amount of the account at the end of the previous year. After providing for the amount placed to renewal and reserve fund account (£10,836), and after paying the dividends on the 6 per cent. first preference shares to June 30th, 1910, on the 5 per cent. second preference shares to September 30th, 1910, and an interim dividend at the rate of 8 per cent. per annum on the ordinary shares for the first half of the year, the balance standing to the credit of the net revenue account for the year 1910 is £8,876. Of this £1,500 has been appropriated to the payment of the first preference dividend to the end of the year, and £625 has to be set aside to meet the portion of the dividend on the second preference shares accrued to the same date. It is proposed to pay out of the balance of £6,751 a further dividend on the ordinary shares at the rate of 10 per cent. per annum, for the past half-year, making, with the interim dividend paid on August 11th, 9 per cent. for the year. This will leave a balance of £1,501 to be carried forward.

For the year 1909 the ordinary dividend was only 8 per cent. and the carry forward £1,756.

Hove Electric Lighting Co., Ltd.—After setting aside £1,500 for repairs and renewals fund, and £3,000 for sinking fund, a final dividend on the ordinary shares for the half-year ended December 31st, 1910, at the rate of 10 per cent. per annum, is recommended, making 9 per cent. for the year, and carrying forward £862. Last year the total dividend was 8½ per cent.

Underground Electric Railways Co. of London, Ltd.

THE directors in their report state that the result of the half-year to December 31st, 1910, shows a substantial improvement. The net revenue from investments and properties (including general interest), after deducting general expenses, amounted to £96,481; the net income from the operation of the power house was £44,715, from which is deducted the interest on £1,000,000 4 per cent. first power house debentures, and a proportion of commission, discount and expenses incurred in connection with the issue required, namely, £20,870, leaving a surplus from the power house of £23,845. The service of the £1,000,000 5 per cent. prior lien bonds required £26,549, and the service of the £2,818,700 4½ per cent. bonds of 1933 required £67,349, leaving a surplus over half-yearly charges of £26,428, which amount will be applied as follows:—Interest at the rate of 1 per cent. per annum on £4,928,050 6 per cent. income bonds of 1948 £24,640, income-tax £1,526, the balance of £262 being put to reserve in reduction of the accumulated revenue deficiencies.

The income from investments for the six months shows an increase of £17,078, or about 21 per cent. over that for the corresponding half-year of 1909. The directors record with satisfaction, that for the first time it has not been necessary for the company to make any payment under their guarantee on the Metropolitan District Railway assented preference stock, as the railway company have declared a dividend for the last half-year at the rate of 3½ per cent. per annum in respect of the preference stock to which the guarantee of the company refers. The amount paid by the company under the guarantee for the corresponding half-year of 1909 was £9,404. The traffic of the railway companies in which the company is interested continues to increase. The report of the London United Tramways, Ltd., shows a substantial increase in revenue for the year, but also an increase in working expenses, chiefly due to the large expenditures for extraordinary repairs to the rolling stock.

Of the eight new Parsons turbines, seven are now in operation at the power house, and the last is in course of erection. Two sets of storage batteries of 5,000 ampere-hours capacity each, and a 1,500-KW. direct connected turbo-alternator, have been installed during the last half-year. The net output of electric energy during the half-year was 66,038,900-KW. hours as against 62,005,000 KW.-hours during the corresponding period of 1909.

The remainder of the report deals with the London Electric Railway Co., whose meeting was reported here last week, and the Parliamentary Bills already mentioned in the REVIEW. The Power House Depreciation Fund amounts to £159,999.

Stock Exchange Notices.—Application has been made to the Committee (1) to appoint a special settling day in and to grant a quotation to :—

Canadian General Electric Co., Ltd.—Further issue of $940,000 common stock in shares of $100 each.

(2) Appoint a special settling day in :—

Pachuca Light and Power Co.—Fully paid scrip for £800,000 5 per cent. first mortgage 50-year bonds.

And (3) to allow the following to be quoted in the Official List :—

Metropolitan Railway Co.—Further issue of £45,294 3½ per cent. "A" preference stock.

Montreal Water and Power Co.—Further issue of £20,000 4½ per cent. first mortgage prior lien gold bonds of £100 each, Nos. 4,418 to 4,617.

Cambridge Electric Supply Co., Ltd.—At the annual general meeting held at the offices, Thompson's Lane, on Tuesday, Mr. A. A. Campbell Swinton, who presided in the absence, through illness, of Mr. D. Munsey (chairman), alluded to the satisfactory nature of the report, and this in spite of the smaller consumption taken by the metal-filament lamps. The consumption in the aggregate was increasing again, and it seemed likely to increase even more in the future. The new lamps had made electric light cheaper than it was, and this was encouraging new consumers to come on to their mains. During the year they had added no fewer than 152 additional consumers, and no fewer than 5,008 lamps. He thought they would agree that was a very satisfactory condition of affairs. The report was adopted.

Para Electric Railways and Lighting Co., Ltd.—The directors report that the revenue for the year to November 30th, after providing for all expenses in Para, is £128,267. Adding thereto the balance of exchange, interest and transfer fees £8,612, and deducting London office expenses and interest and sinking fund on debenture stock, £45,775, a balance of £91,104 remains. The directors have transferred to depreciation and renewals reserve £15,000, and to contingencies reserve £13,000. An interim dividend for six months of £3 per cent. on the preference shares was paid on September 1st amounting to £8,850. It is now proposed to pay a final dividend of £3 per cent. (making 6 per cent. for the year), which will absorb £8,850. An interim dividend for six months of £4 per cent. on £389,205 ordinary shares was paid on September 1st, amounting to £15,568. It is now proposed to pay a final dividend of £6 per cent. (making, with the interim dividend, £10 per cent. for the year), which will absorb £23,357, leaving a surplus revenue for the year of £6,479, plus £954 brought forward, leaving to be carried forward £7,433.

Newcastle and District Electric Lighting Co., Ltd.—Units sold in 1910 showed an increase of 12·5 per cent. The total dividend for the year on the ordinary shares is 3 per cent., carrying forward £4,807. Last year the dividend was at the same rate, and the carry forward £2,938.

(*Continued on page* 310.)

THE MIDLAND RAILWAY CO.'S POWER STATION, DERBY.

The town of Derby is to the Midland Railway very much what Manchester is to the cotton industry; it constitutes the company's headquarters both for administrative and manufacturing purposes—the industrial centre of the system.

The company's works which are situated here comprise the locomotive, carriage, wagon, signal, telegraph and other departments, giving employment to a large number of men and incidentally calling for a large amount of power. Until recently the various shops were, generally speaking, driven by isolated steam engines, fed through considerable lengths of steam piping, and as the transmission of power to the machines from the engines entailed consider further losses in shafting and gearing, the arrangement evidently offered considerable scope for improvement.

With this object in view, the Railway Co. last year erected an electric power station which will supply the power requirements of the various departments mentioned above, as well as their lighting and the lighting of the whole of the chief offices of the company, which are situated at Derby.

The power station, a brick building, of which the exterior is shown in fig. 1, is separated from the locomotive works by a canal, while some distance behind it runs the River Derwent from which condensation water is obtained.

The station is approached by a bridge spanning the canal (fig. 5), which also carries a coal conveyor, feed water pipes, and the cables leading into the works.

Coal is delivered on the locomotive works side of the canal, in railway wagons, which are tipped by means of hydraulic power, the fuel contents falling through the end door into a 20-ton hopper, from which by means of a bucket elevator and the conveyor belt passing over the bridge and into the boiler house, the fuel is delivered to the bunkers.

The elevator and conveyor belt were supplied by Messrs. Leech, Goodall & Co., and have a capacity of 15 tons per hour; the belt is of waterproofed canvas, 185 ft. long and 18 in. wide, and runs flat over horizontal rollers, as shown in fig. 6, an arrangement which is claimed to save wear and tear as compared with the usual curved belt.

Fig. 1.—Exterior of Midland Co.'s Works Power Station, Derby.

Considerable height was saved in the boiler house by adopting a system of deflecting ploughs instead of the usual throw-off carriage for discharging the fuel from the conveyor belt into each bunker.

A leather-faced plough board, and a brush for taking off dust, &c., are provided over each bunker, the arrangement being shown in fig. 7.

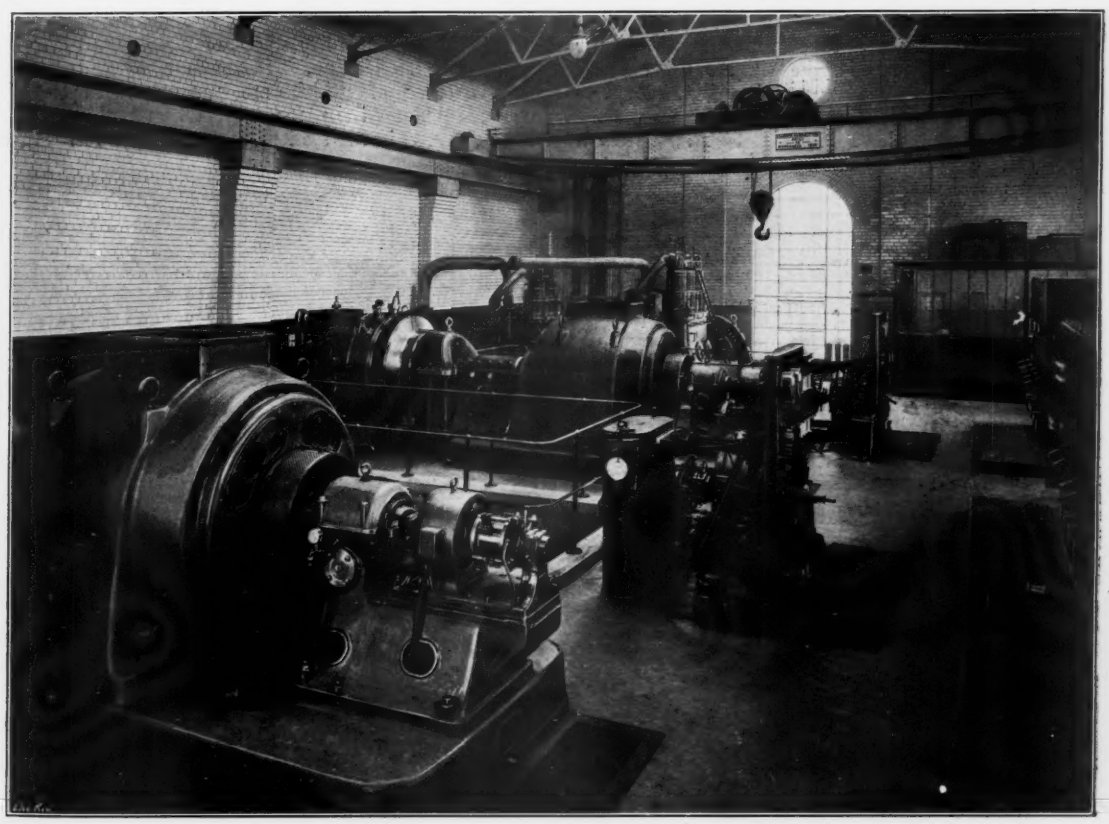

Fig. 2.—View in the Engine Room showing Disk and Drum Turbines, Converters, &c.

A 10-ton crab, made by Messrs. Royce & Co., running on the bottom flange of the bridge girders, was used to convey machinery, &c., to the power station while in course of construction, and is now used to remove ashes, &c., during ordinary running.

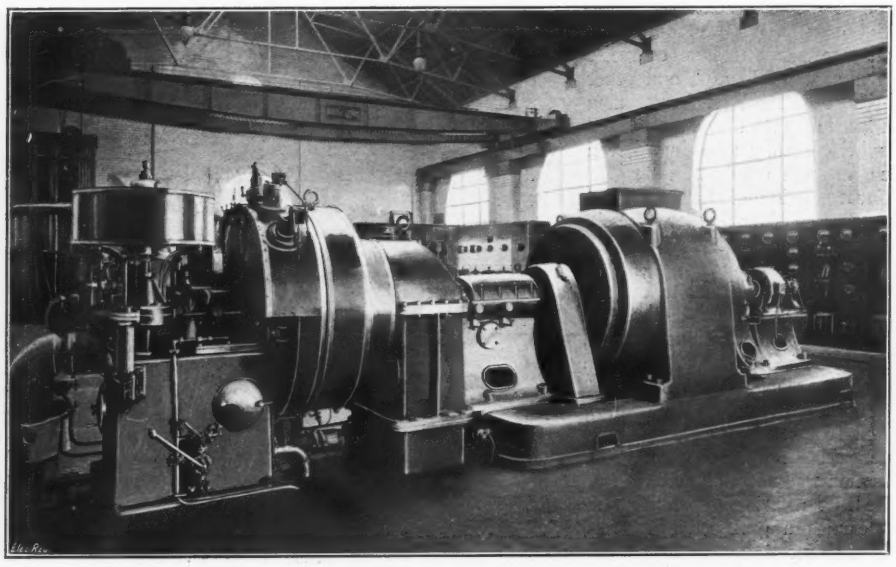

Fig. 3.—Willans Disk and Drum 1,250-kw. Turbo-Generator.

Three Stirling boilers each to evaporate 20,600 lb. per hour with feed at 80° F., are installed in the boiler house. The working pressure is 170 lb. per sq. in. with 150° superheat. The boilers are of the five-drum type with three steam and two mud drums, and have 480 tubes 3¼ in. diameter, a heating surface of 6,021 sq. ft. and a grate area of 109 sq. ft. Each boiler weighs complete 46 tons.

The temperature of the flue gases is about 500° F.; no economisers are installed, as the inexpensive fuel, local smudge, costing on the average 18d. per ton at the pit, left no margin for their profitable employment. The boilers are equipped with superheaters of the "Foster" type, supplied by Messrs. Heenan & Froude, as sub-contractors to the Stirling Boiler Co.; also two automatic stokers per boiler, of the Underfeed Stoker Co.'s make. Fuel is fed into the stoker hoppers direct from the bunkers above.

Each boiler forms an independent steam generating unit, having its own chimney, forced draught fan, &c., and can, if necessary, independently supply one set of generating plant in the engine room. Thus each boiler is coupled by a short flue with a steel chimney in the rear outside the boiler house; the chimneys are 4½ ft. internal diameter, and 60 ft. high above the grate level, being lined to a height of 30 ft.

Behind each boiler is a Heenan & Froude fan, giving normally 12,000 cb. ft. of air per minute at 2¼ in. water gauge, and driven by a variable speed D.C. motor, constructed—as in the case of all the direct-current motors used—by the railway company itself, and supplying the necessary forced draught to the furnaces through ducts running from back to front (see fig. 10).

The ash, clinker, &c., collects on the dumping plates in the furnaces and is tipped into hoppers under the boilers, which are emptied at intervals, the ashes being removed in a small hand truck through an ash subway, leading outside the boiler house.

The principal plant in the engine house consists of two turbo-generators, each 1,250 KW., which were supplied by Messrs. Willans & Robinson. The turbines are of the disk and drum type, and run at 3,000 R.P.M. There are two rows of impulse blading, and five stages, of three rows each, of reaction Parsons blading. Steam is supplied through 14 nozzles, four of which are permanently open, three operated automatically for overload, and the remainder hand-operated in two sections of four and three. In case of failure of the main governor, an emergency governor comes into operation. Forced oil lubrication, at 10 lb. pressure is provided, with filtering and cooling arrangements. Each turbine is coupled to a Siemens three-phase generator, of the two-pole revolving field type, generating

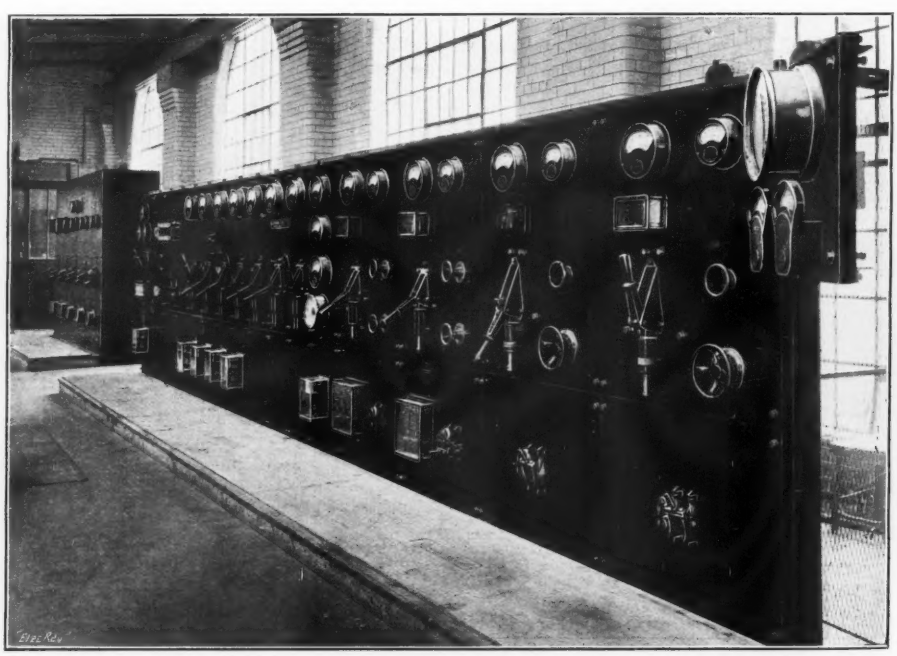

Fig. 4.—Main L.T. Switchboard, with H.T. Board at the End.

energy at 460 volts and 50 cycles. These machines are entirely enclosed; air for their cooling is drawn in from the basement by the rotor-fan action, and delivered through vents over the stators.

A 110-volt exciter is direct-coupled to the extremity of the main shaft as shown in figs. 2 and 3, in which the large bulk of the generator as compared with the turbine, due to the greatly decreased axial length required by the disk and drum construction, is especially striking.

The turbines each exhaust direct into a Willans surface condenser in the basement, with a cooling area of 2,160 sq. ft. and fitted with a vacuum augmentor; alternatively an atmospheric exhaust through an automatic valve is provided. Three-throw Willans-Edwards type air pumps, gear-driven by a D.C. motor, are provided to each condenser.

Two small engine-driven sets are also installed for use during the light nights and for week-end loads.

These are of Willans central valve type, and have been removed from other electrical stations of the railway company; one is of 250 KW., and the other of 160-KW. capacity.

FIG. 5.—COALING BRIDGE OVER CANAL, WITH ELEVATOR, &C.

The generators of these sets are new, and were supplied by Messrs. E. Scott & Mountain; each is fitted with a 110-volt exciter on the end of the shaft.

These sets originally ran non-condensing, but a single condenser for the two has been fitted, which was supplied by Messrs. Storey, of Manchester; the air pump is by the same firm, and is an Edwards type, two-throw, 12 in. diameter × 10 in. stroke, driven through gearing by a D.C. motor.

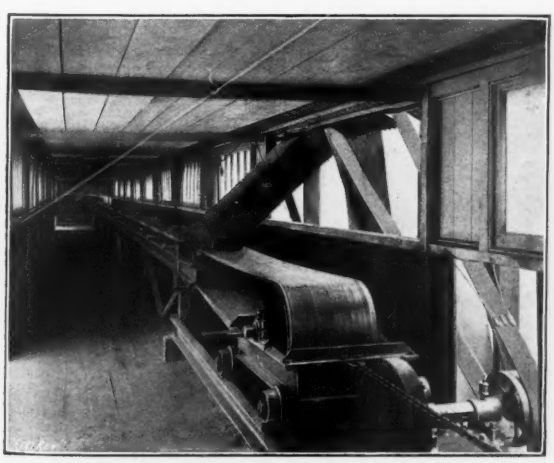

FIG. 6.—BELT COAL CONVEYOR.

These engines exhaust through a Reid & Adie oil separator, into the condenser; an automatic atmospheric exhaust is provided, as for the turbines.

The condensed water from the turbines is returned either direct to the hot well, or through a Lea recorder notch tank. The piping is so arranged that any one or all of the discharges can be measured. The recording instrument is fixed on the engine room floor.

The circulating water, as mentioned previously, is obtained from the River Derwent, and is pumped up by two Rees Roturbo pumps, each of 2,200 gallons per minute capacity. These are situated in the bottom of a well, communicating with the river through screens, and are driven by 25-H.P. vertical shaft interpole motors of the company's own make, installed in a pump house over the pit, and controlled from the engine room. The water is taken through pipes of 2 ft. internal diameter, to the condensers, and returned to the river, the outlet being drowned at all levels of the river, so maintaining a siphonic action. A steam ejector is provided in the engine room to deal with the air released from this water, and a small electrically-driven air-pump will shortly be installed for this purpose.

Each of the turbines has direct steam connection through a steam separator, with one boiler unit, while the two Willans engines are supplied by the third boiler unit, but a cross-header provides for coupling the branches. The steam piping is of steel, with welded flanges and branches, and expansion is accommodated by large bends, &c.; Hopkinson-Ferranti valves with steel bodies are used. In the engine-room basement are also installed a Hall steam feed pump, of 40,000 lb. per hour capacity, and a similar sized electrically-driven turbine pump running at 2,250 R.P.M., and driven by one of the Midland Co's. 15-H.P. D.C. motors.

We understand that the turbine plant operates on 16½ lb. steam per KW.-hour under full lead conditions.

The output of the station, estimated to reach 1,900 KW. under present conditions, is dealt with in a L.T. three-phase switchboard (fig. 4), constructed by Messrs. Cowans, Ltd., and including four generator, three transformer, and four feeder panels; also testing, station lighting, lighting distribution and spare panels.

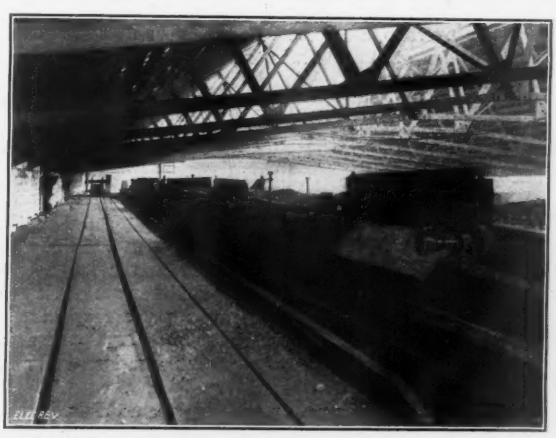

FIG. 7.—THROW-OFF PLOUGHS FOR DISCHARGING CONVEYOR.

The machine and feeder panels are fitted with loose-handle triple-pole oil circuit breakers, with reverse relays on all four machines, and overload relays in addition on the two smaller ones. No relays are fitted on the feeder panels; a watt-hour meter is provided for each feeder, and a totalising panel contains three phase ammeters, a wattmeter, and a watt-hour meter for measuring the total generator output.

The neutral point of one machine only, at a time, is grounded through a small limiting resistance, in connection with which white and red lamps are provided to indicate a normal or faulty condition. The transformer panels supply three 400-K.V.A. oil-cooled Westinghouse transformers for raising a portion of the output, about 600 KW., to 6,600 volts pressure for transmission to the carriage and wagon department, situated some distance from the power station.

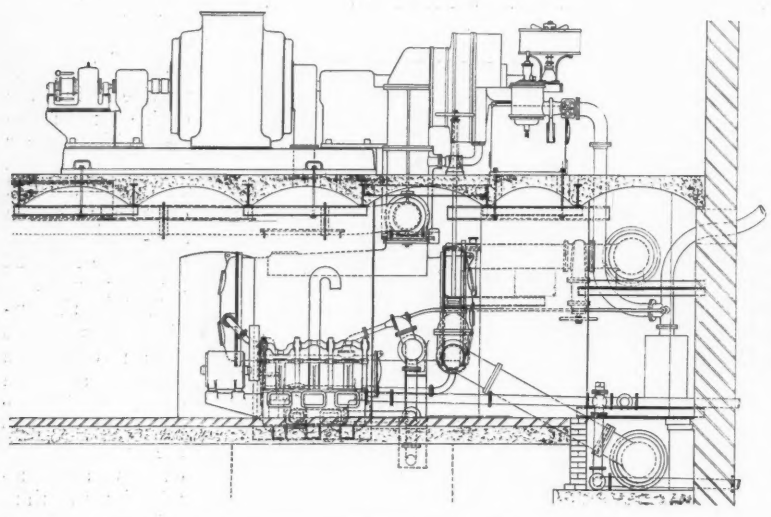

FIG. 8.—ARRANGEMENT OF TURBINE AND CONDENSING PLANT.

A H.T. cellular switchboard, built up in sheet steel with Ferranti switchgear, by the Midland Co.'s staff, and shown in fig. 1, deals with the outgoing H.T. current; it comprises three transformer and two feeder panels (the H.T. feeders being in duplicate) divided by horizontal partitions, and with the bus-bars running along the top of the panels.

The transformers are immediately under their own panels, which contain three-pole oil and isolating switches; the same arrangement obtains in the feeder panels, where the oil switches are fitted with T.L. overload relays, and the conductors enter the feeder dividing boxes in the lowest cells. The arrangement, which is very compact, is similar to that adopted in the company's Heysham power plant.

For the supply of 440-volt direct-current for crane driving throughout the works, and for the auxiliary motors in the power station, two 150-KW. Westinghouse interpole-converters are installed, as shown in fig. 2, each set having its own auto-transformer and A.C.-D.C. switch panels close by.

These machines are fitted with ball bearings, as is the case with many of the motors in use.

Although a large amount of lighting is supplied from the three-phase bus-bars, no voltage regulator has been found necessary.

A 15-ton three-motor travelling crane, by Adamson, Ramsbottom & Co., is provided in the engine room.

The main cables to the various shops pass up the end wall of the engine room, and over the bridge to the locomotive works, along the walls and roofs of which they are carried to the different feeding points. These cables are all of the three-core bitumen insulated type, except the H.T. cables to the carriage and wagon shops, which are paper insulated and lead covered, and are carried in wooden boxing.

The work of changing over the old steam drives in the shops is being rapidly pushed on, and some indication of the methods adopted can be gathered from work already carried out. To take the case of the boiler shop, in which over 1,000 ft. of shafting is being displaced by the introduction of electrical driving, the main 440-volt feeder passes down one end of the building to short distributing bus-bars, to which are coupled, by short leads, four Eckstein Heap oil switches, each controlling the supply to one bay.

Cables lead from the oil switches up to the roof, under which braided copper or stranded aluminium conductors are run on insulators, motor connections being teed off and run in screwed barrel down the walls.

For the supply to portable tools, such as drills, &c., the 440-volt supply is transformed down to 110 volts pressure, a small distribution board with switch fuses controlling the bare wire distributors which are carried on insulators on the walls. Simmonds plug fittings are provided at intervals on the walls in connection with this 110-volt supply.

The motors are uniformly of the squirrel-cage type and up to 10-H.P. sizes are switched direct on to the mains, while above the size mentioned, star-delta oil switches are used, of the Cowans, Eckstein Heap or Ellison types. A typical example of what may be done in electrical driving was two sets of reversing rolls, each driven direct by a squirrel-cage motor, controlled through small main and reversing switches, and reversed under load. This arrangement displaced a great length of shafting and an open and crossed belt drive in each case. The bulk of the lighting in the offices and the Midland Co.'s station hotel is carried out by metal-filament lamps on 100-volt circuits, supplied through auto-transformers.

It is expected that from 250 to 300 motors will ultimately be installed in the shops, the three-phase motors in particular sizes being supplied by particular makers, for the sake of uniformity of design. The Midland Co. constructs all its own direct-current motors for use on its system.

We understand that from the commencement of excavating for the power station to the running of the first turbine, a period of some five months only elapsed, and that the complete plant cost something like £11 per KW., figures which, in view of the results obtained, reflect great credit on the company's engineering staff. The designers aimed at simplicity and low generating costs, and appear likely to achieve both objects.

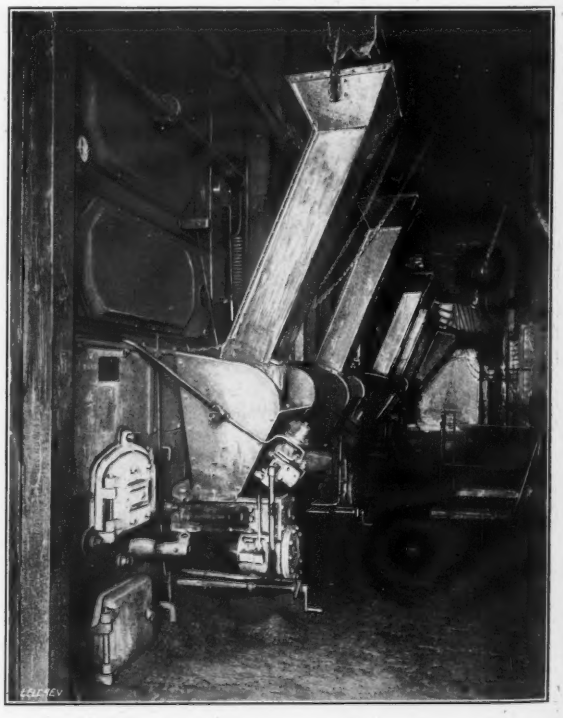

FIG. 9.—INTERIOR OF BOILER HOUSE.

Our thanks are due to Mr. H. Fowler, the company's chief mechanical engineer, for permission to publish this description; to Mr. J. Dalziel who, under Mr. Fowler's direction, designed and supervised the work, and to him and his assistants for courteously explaining the various details.

THE LIMITATIONS OF LABOUR.

[COMMUNICATED.]

The heavy losses incurred last year by a large firm of electrical manufacturers recently formed the subject of a discussion between the writer and a fellow engineer. The latter quoted an instructive explanation given by a Canadian workman employed by the firm in question. When first engaged this man proceeded to carry out his duties in the energetic manner customary in the Canadian engineering works where he had formerly been employed, with the result that he was approached by his *confrères* and urged to moderate his output in accordance with their practice. So persistent were these gentry that the Canadian was compelled to limit his efforts to about 50 per cent. of his capabilities.

This incident occurred in works where every possible precaution is taken to exclude trade unionists, and if the conditions indicated extended to all departments a very serious state of things is disclosed.

Features of this description are invariably exaggerated, and if this were an isolated instance no great weight would attach to it. Unfortunately, however, similar evidence is forthcoming from many other quarters, and one is driven to the conclusion that there is an appreciable limitation of output amongst mechanics all over the country.

If the work in all competitive countries were carried on under the same handicap no great harm would be done, but such does not appear to be the case, consequently foreign manufacturers are able to undersell us in the open markets of the world, including our own.

It is extremely difficult to see how this trouble can be overcome. Premiums and bonus piecework systems have been tried, and although a certain measure of success has attended their introduction, the principle is condemned by the trade unions.

In all probability overtime and the remote chances of promotion have a strong bearing upon this question.

Under modern conditions with costly semi-automatic machines, standing charges tend to assume an increasing proportion of the total cost of production, hence, although extra wages have to be paid for overtime, this item is more than counterbalanced by the reduction in capital charges in proportion to the output. In other words, it pays better to work a small equipment for long hours than a larger number of machines and men during the ordinary working week, and this system is being largely adopted in preference to making extensions.

A workman might well be expected to put forth his best efforts during a short working day provided that such endeavours produced additional pay as is the case with piecework. On the other hand, only men in their prime and of strong physique can keep going at "concert pitch" for 70 or 80 hours a week, and there appears to be some show of reason in their objection to the growth of this system.

The standard working week is tending to shorten in all countries, and there is not the slightest doubt that 48 hours will become universal in the near future. Unfortunately this country takes the lead in these matters, our working hours being always shorter than those of competitive nations. The relations between the workmen in all countries are, however, becoming more intimate, and it is not improbable that modifications in working conditions will eventually be introduced amongst our competitors simultaneously with their adoption over here.

Man is naturally a lazy animal, and, unless spurred on by ambition or the fear of consequences, the majority of men would do no work at all. The consequences of idleness are tending to become less severe, and to counterbalance this feature some fillip in the way of quicker promotion would appear to be necessary.

There is no doubt that better education will effect a change in this direction by giving the men less remote chance of rising into responsible and well-paid positions. Support, if needed for this contention, may be found in the larger proportion who put forth their best efforts amongst the better educated office and technical staffs, and even if placed in the position of an ordinary workman the man of education will exhibit a strong desire to improve his position by working his hardest. This effect is engendered by the knowledge that there is no limit to the degree of eminence to which he may attain. The rise of the workman, on the other hand, is handicapped by his defective education, and unless he devotes his entire spare time to study, he can scarcely hope for a position beyond that of a foreman.

Here and there a workman *does* find time for mental training and rises to a position of great responsibility, but such instances are too few and far between to act as an incentive to his *confrères*. Then it must be remembered that even without overtime the working day is a fairly long one, and a man who has risen at 5.30 a.m. is not so fit for evening book-work as the office employé whose duties begin at 9.0 a.m.

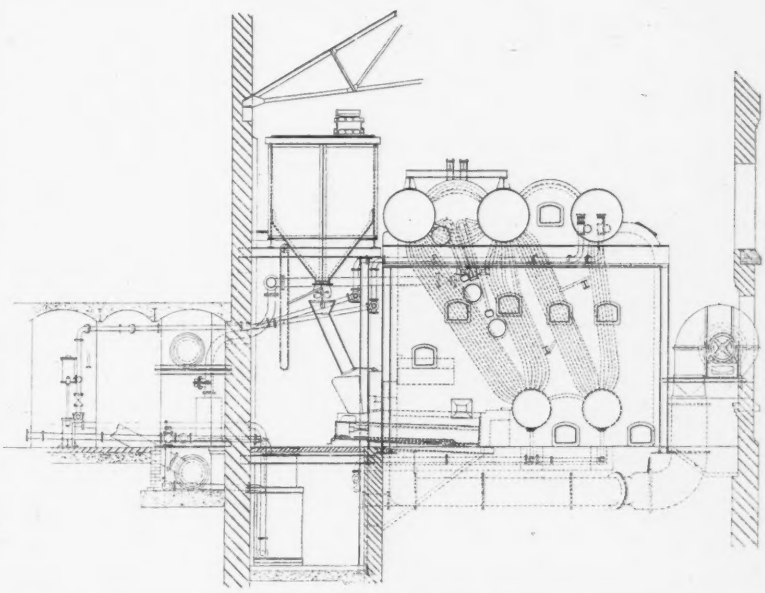

Fig. 9.—Midland Railway Co.'s Power Station, Derby; Sectional View, showing Arrangement of Boilers, &c.

As things are at present the workman who desires to rise is heavily handicapped by lack of education and long hours, when compared to the office man who starts with a better mental equipment which he has ample time to improve.

These adverse conditions for the workman are gradually disappearing. Free education is improving in quality, and facilities for evening study are now given by the more enlightened employers, in the form of lectures and classes with time off to attend them when overtime is being worked. Furthermore, draughtsmen and other junior technical assistants are being recruited from the works apprentices by selective examinations or other means.

The limitation of output is a result of dissatisfaction with existing conditions. Given an equal chance of rising by better education and shorter hours, with the more fortunate office assistant, the workman will welcome the bonus piecework system as giving him an opportunity of showing his capabilities.

Bolton Electricity Works Staff Dinner. — The fourth annual dinner of the staff and employés of the above works was held on Wednesday, February 15th, at the Halliwell Lodge Hotel. Mr. A. A. Day (electrical engineer) presided, and was supported by Mr. B. S. Hornby (chief assistant engineer) and others.

LEGAL.

MARCONI AND OTHERS *v.* BRITISH RADIO-TELEGRAPH AND TELEPHONE CO., LTD.

MR. JUSTICE PARKER, in the Chancery Division on Tuesday (February 21st), delivered his reserved judgment in this action, upholding the Marconi Patent No. 7,777 of 1900 for improvements in apparatus for wireless telegraphy.

His LORDSHIP, having reviewed in detail the practical application of wireless telegraphy, without which, he said, it was impossible to come to a proper conclusion as to the nature of the invention, came to the conclusion that there could be no doubt as to the utility of the invention, because it enabled messages to be sent a distance that had never been heard of before. That the patent had not been anticipated, he thought, was shown by the fact that others had appreciated the difficulties that were overcome by the Marconi invention, and yet no one had previously achieved the same object. Braun had been relied upon as an anticipation, but he failed to find in the letterpress of Braun's specification the remotest reference to the problem that Marconi's patent of 1900 was intended to solve. In his opinion, any competent electrical engineer would have put Braun on one side as being founded upon a mistake. On the question of infringement, the defendants endeavoured to escape by saying that Marconi referred to a two-coil transformer, and in the defendants' apparatus an auto-transformer was used. He did not think that the transformer was an essential part of the patent, and he did not think that any competent engineer would not have known that what could be done by an air-core two-coil transformer could also be done by an air-core auto-transformer. He came to the conclusion that the invention was useful, was sufficiently described, was not anticipated, and that the defendants had taken all the essential parts of the invention, notwithstanding that they had substituted an auto-transformer for a two-coil transformer. He accordingly granted the injunction asked for, with a certificate of validity of the patent; he gave the plaintiffs the costs of the action, except so far as they had been increased by the claim in respect of the two later patents; and granted an inquiry as to damages, the costs of which were reserved. The case with regard to the two later patents, which were said to refer to a spark gap and a detector, stood over generally, with liberty to apply, and the injunction was suspended, if notice of appeal was given within 14 days.

We shall give the judgment more fully in our next issue.

TRAMWAY PASSENGER'S CLAIM.

IN the King's Bench Division on Monday, February 20th, before Mr. Justice Pickford and a common jury, W. J. Angliss, formerly a hatter's cutter in Holborn, sued the Metropolitan Electric Tramways, Ltd., for damages for injuries received whilst stepping off one of the company's cars between Stamford Hill and Wood Green. After hearing the evidence, the jury returned a verdict for the defendant company.

MERRETT *v.* WEST HAM CORPORATION.

IN the King's Bench Division on Saturday, before Mr. Justice Pickford and a common jury, John Merrett, a cab driver, was awarded £150 damages against the West Ham Corporation for personal injuries received in a collision with one of defendants' electric cars last July. Plaintiff was thrown from the box of a funeral carriage he was driving, and had four ribs broken.

CITY NOTES.

(*Continued from page* 304.)

Smithfield Markets Electric Supply Co., Ltd.

MR. H. S. LEON (chairman) presided on the 17th inst. at the offices, Charterhouse Street, E.C., over the meeting of this company. In moving the adoption of the report (see ELECTRICAL REVIEW, page 228), the CHAIRMAN said the amount standing to the debit of the capital account was £116,723, which was £3,855 less than last year, the reduction being accounted for by the scrapping of a certain quantity of their plant, which they were going to replace with more up-to-date machinery. On the other hand, the £8,000 second mortgage debentures no longer appeared in the accounts, as they were paid off in May of last year. The new plant was going to cost about £8,000; and as the board had no intention of creating more permanent debt, the finding of that sum would strain all the resources of the company, and any money which had to be borrowed for this specific purpose would be a temporary loan. Turning to the revenue account, the expenditure was slightly less, while the gross receipts had increased by £828. This was explained by the higher prices received for the current. Several new customers had been obtained, which was an indication that the metallic-filament lamp enabled electric light to hold its own successfully with gas; and notwithstanding the increased price they had charged for current, it was satisfactory to be able to record a still further accession of new customers since the beginning of the year. The gross profit was £942 better than last year, equal to 42 per cent., and the revenue per lamp had been maintained up to the level of last year. The assessment of the company's property had, in the opinion of the board, been far too high for some time, and as the result of the appeal at the last quinquennial period they had obtained a satisfactory reduction. The saving this year would not be much, but in the next five years it should average about £140 a year. The net profit was £1,445, an increase of £1,138 over last year, and of this £1,000 had been placed to a sinking fund for the redemption of the debenture stock. Owing to their financial position it was found inadvisable to pay a dividend and consequently the choice of disposing of the profit lay between allowing for depreciation or creating a sinking fund, and they chose the latter method because the sooner the whole amount was provided the better for the shareholders. Nothing had been placed to depreciation this year, and, in fact, the sum standing to the credit of that fund had been reduced by the value of the machinery removed. Strictly speaking, therefore, a dividend had not even been earned. There was no reason to anticipate that so large a sum would be put away every year to the sinking fund for redemption purposes, but, of course, a sinking fund must be provided. Some shareholders seemed to hold the opinion that the board wilfully withheld dividends. He had much sympathy with the shareholders who were receiving no dividend as he was a large holder himself, but this was rather an unfair accusation to bring against the board. As a matter of fact, the dividends paid in the earlier history of the company ought never to have been paid, and it was fortunate that the cash payments were stopped before it was too late, for otherwise it would have been disastrous for the company. The position, however, was altering for the better, owing to the arrangement the board came to with the City Corporation for a long lease, which was sufficient, with ordinary prudence, to enable them to pay off the debentures and to obtain a valuable reversion and fair dividend for the shareholders. He wished to be perfectly frank and to say that the board could not, in the permanent interests of the company, afford to part with much cash until the assets were written down to their marketable value. By the installation of the new plant, it was hoped that considerable saving in expense would be made. The plan at present before the board was to redeem the debentures or that portion of them which represented over-capitalisation and to do so within about 30 years. Having referred to criticism having been made of the directors taking fees, the chairman said that, seeing what the directors had done, it was almost an impertinence to ask them to forego their fees. He believed that the current year would be considerably better than the last. Their struggle for existence was now concluded, and they were in a safe position and adding new business. They had obtained some new and big customers within the last fortnight, and hoped to get every one of the tenants in time. The only thing which could seriously jeopardise their position was an unsound financial policy, and he hoped that shareholders would back up the board in maintaining a policy which would stand any criticism that financial experts liked to bring to bear upon it.

MR. J. BROWNE MARTIN seconded the motion.

MR. A. E. BROWN said they had heard a similar tale for years, and he did not think the board ought to allocate the profits for the first debentures. As an original shareholder, he emphatically protested against that. He was, of course, pleased to hear the satisfactory report so far, but did not think the ordinary shareholders had been fairly treated. Anyone reading the report would think it a philanthropic institution instead of a business concern. The interests of the ordinary shareholders seemed to be absolutely neglected.

MR. J. BROWNE MARTIN pointed out that the chairman did not say the whole of their profits were going to the sinking fund.

MR. BROWN said the chairman had alluded to 30 years; and he thought that after 13 years the ordinary shareholders were entitled to be considered.

The CHAIRMAN said the board could not help it, for the debenture-holders had the first call on the company.

MR. HUGGINS, as an orignal shareholder, also totally disagreed with Mr. Brown. What the board was doing was undoubtedly in the interests of the company as a whole.

The report was then adopted.

Telegraph Construction and Maintenance Co., Ltd.

THE directors report that the accounts for 1910 show a net profit of £110,717, after charging the interest on the debentures. To this sum is added £111,444 brought forward, making a total of £222,161. From this is deducted the interim dividend of 5 per cent. paid July 19th, 1910, amounting to £22,410, leaving £199,751 to be dealt with. Of this sum the directors propose to distribute a dividend of £1 4s. per share, together with a bonus of 12s. per share, absorbing £67,230, being at the rate of 15 per cent., and making with the amount already paid a total dividend and bonus for the year of £2 8s. per share, or 20 per cent., free of income-tax, and to supplement the reserved fund by £24,943 (making it £75,000), leaving £107,578 to be carried forward. The company's profits have been favourably influenced during the year by the sale of freehold property at Woolwich, and in consequence the board propose the increase in the reserved fund. The general business of the company during the past year has been very satisfactory. The company's works and steamships have been maintained in their usual state of efficiency. As announced to the shareholders at the last half-yearly meeting, the Right Hon. the Earl of Selborne K.G., has accepted the chairmanship of the company.

South Metropolitan Electric Light and Power Co., Ltd.

THE directors report for the year ended December 31st, 1910, that the revenue account shows a credit balance of £27,009, which, with £1,106 brought forward, makes a total of £28,116. After deducting £11,065 for interest on debenture stock paid and accrued, and for other interest, £5,004 for interim dividend paid on the 7 per cent. cumulative first preference shares, and £1,500 for interim dividend paid on the 6 per cent. cumulative second preference shares, there remains £10,546. The final dividend to December 31st, 1910, upon the 7 per cent. cumulative first preference shares requires £5,004; final dividend to December 31st, 1910, upon the 6 per cent. cumulative second preference shares, £1,500; depreciation account, £2,000: there is written off balance of Crystal Palace account £800, and £1,243 is carried forward.

Year.	Lamps (35-watt). Connected at end of year.	Increase.	No. of consumers.	Gross revenue.	Expenditure.	Net revenue.
1908	177,628	17,248	3,649	£42,954	£15,978	£26,976
1909	191,302	13,674	3,916	£41,847	£16,465	£25,382
1910	208,046	16,744	4,305	£44,687	£17,678	£27,009

In order to meet the requirements of consumers and to develop the more general use of electricity for light, power, heat and other domestic purposes, the company has opened extensive showrooms at 181, 183 and 185, High Street, Lewisham. The opening took place on July 11th last, and the business resulting is satisfactory. In accordance with the terms of agreement with the West Kent Electric Co., Ltd., the company has subscribed for 10,000 shares of £1 each, of which 10s. per share has been called up. Supply is now being given at Mottingham and Hayes, and the company's prospects are encouraging. The directors have appointed the Hon. Laurence Alan Brodrick as an additional director.

Imperial Tramways Co., Ltd.

THE directors' report for the year ended December, 1910, is as follows:—

Middlesbrough, Stockton and Thornaby Electric Tramways.—The gross receipts from this undertaking amounted to £51,922 as compared with £49,670, an increase of £2,252. The passengers carried were 10,276,749, an increase of 442,536. After placing £1,500 to the reserve fund for renewals (bringing the total of that fund up to £18,500) the net profit for the year is £16,303, as compared with £16,142. The directors report that with the improvement in the trade conditions of the districts served by the company's system there has been a substantial increase in the traffic receipts. A Bill to extend the time for the construction of the company's authorised extensions, and for other purposes, has been deposited, and was to be submitted at a separate meeting yesterday.

London United Tramways, Ltd.—The results for the past year show considerable improvement, the receipts having increased by £15,432, and the net revenue by £7,788, and after payment of fixed charges, the available balance of net revenue is £30,814. The directors of the London United do not propose to make any dividend distribution for the past year, but recommend that £30,000 be added to reserve. The accumulated arrears on the Imperial Co.'s holding of 44,446 preference shares in the London United now amount to 11¼ per cent. and represent a total of £50,001.

General.—Although the prospects of the London United appear to be more favourable, the non-receipt of dividend from that undertaking continues to seriously affect this company's revenue account, and the directors regret they are unable to recommend the payment of any dividend on the preference and ordinary shares. The revenue account for the year shows an available amount of £16,096, and after payment of the interest on the debenture stock for the whole year, amounting to £12,712, there is a balance (including £4,006 brought forward from last account) of £7,390, which the directors recommend should be carried forward. The directors mention their regret at the death of Sir Clifton Robinson, for so many years managing director and engineer.

London Electric Supply Corporation, Ltd.

THE report of the directors for the year 1910 states that the profit on the working is £53,225, against £50,686 last year. To this is added the amount brought forward, viz., £3,419, less interest on temporary loan, viz., £1,877, making a total of £54,766. Out of this the interest on debenture stock to December 31st, viz., £15,494, has been paid, leaving £39,272 to be appropriated. The board propose to pay a dividend of 6 per cent. on the preference shares (of which an interim dividend of 3 per cent. was paid on September 1st, 1910), viz., £23,952; a dividend of 2 per cent. on the ordinary shares £6,660, carrying to reserve account (making a total of £72,500) £5,000, and carrying forward £3,660. The supply has been efficiently maintained during the year. The number of units sold amounted to 13,538,124, as against 10,308,537 last year. The safety, economy, and efficiency of the single-phase system having been proved in connection with the supply of power (nearly 5,000,000 units per annum) to the London, Brighton and South Coast Railway for working their South London line, the railway company decided to proceed with the electrification of other portions of their suburban system, and a new contract was entered into on July 12th last for the supply of electric power up to 30,000,000 units per annum. This contract is for 17 years. An order for turbine plant of 14,000 H.P. has been placed to deal with it. Under powers given by the London Electric Supply Act, 1908, which for the first time enabled the London companies to associate with each other, the Corporation entered into agreements with the Westminster and St. James' Electric Supply Companies, which have received the approval of the Board of Trade. The Westminster and St. James' Companies take over the management of the part of this company's undertaking that lies within their districts under the following conditions:—

(*a*) That the net revenue derived from the two districts, based upon the year ended December, 1908, viz., £26,245, plus £2,000 per annum, be paid to this corporation by the Westminster and St. James' Companies up to the termination of the order, viz., August 26th, 1931.

(*b*) That the capital expenditure of the London company in the two districts, viz., £130,000, be repaid in full whenever the undertaking is purchased by the London County Council. Under this clause there will be invested in the names of trustees on account of the London company £4,255 per annum for 22 years, which sum, and the accumulation of interest at the end of this period, will equal (on a 3 per cent. basis), the capital expenditure, and thus ensure its repayment.

(*c*) A bulk supply of electric energy to the Westminster and St. James' Companies for the existing customers of the London company.

The plant and machinery have been maintained out of revenue, and are in an efficient condition.

Bristol Tramways and Carriage Co., Ltd.

THE directors report that for the year ended December, 1910, the gross receipts amounted to £311,121, and the working and general expenses and renewals to £248,957, leaving a net revenue of £62,164. There have already been distributed interest for the year on 4 per cent. mortgage debenture stock, 4½ per cent. mortgage debenture stock and on deposits and bankers' interest, £22,237: dividend on 4 per cent. preference shares for the year (subject to income-tax), £18,833; interim dividend on the ordinary shares at the rate of 4 per cent. per annum (subject to income-tax), for the half-year ended June 30th, £9,417; and it is proposed to appropriate the balance as follows:—Final dividend on the ordinary for the half-year at the rate of 4 per cent. per annum (subject to income-tax), £9,417; addition to reserve fund for contingencies and renewals, £2,260. The interest on investments has been carried direct to the credit of the reserve fund, and the value of the securities having been adjusted to market prices at December 31st, the total of that fund was increased to £205,870. With the addition now proposed the reserve fund will be further augmented to £208,130. The receipts from the tramways department show an increase of £6,630, or just over 3 per cent., whilst those of the carriage department have increased by £18,176, or no less than 26 per cent. The total number of passengers carried during the year on the company's cars and omnibuses was 47,454,560, as compared with 45,839,738 in the previous year, an increase of 1,614,822. During the past year the extensive relaying of lines, as foreshadowed at the last general meeting, has been carried on, and a similar programme is arranged for the present year. A Bill to further extend the time for the construction of the company's authorised extensions has been deposited, and was to be submitted at an extraordinary meeting yesterday. The directors record their regret at the death of Sir Clifton Robinson, who was appointed first traffic manager to the company in 1875, a position which he occupied till 1882. Some years after, on his return from America, he became the company's engineer, and later on in 1900 was elected a director. Mr. Hugh G. Doggett has been elected to fill the vacancy.

Mersey Railway Co.

THE directors report that for the half-year ended December 31st, 1910, the train-mileage run was 332,437 miles as compared with 337,506 during the corresponding six months of 1909. The number of passengers conveyed has been 6,026,032, as against 5,910,603, exclusive of season ticket holders. The total receipts from all sources for the half-year have been £55,419, as compared with £54,363 for the corresponding period of 1909. The working expenses, exclusive of the charges for pumping, ventilation, and lifts, have been £27,796, equal to 50·16 per cent., as against £29,286, equal to 53·87 per cent. These charges for pumping, ventilation, and hydraulic lifts, for the past half-year amounted to £2,913, equal to 5·26 per cent., as compared with £3,505, or at the rate of 6·44 per cent. In accordance with the provisions of the Mersey Railway Act, 1910, £5,006 standing at the debit of the net revenue account at the close of the half-year will be transferred and charged to the capital account of the company during the current half-year.

Farnham Gas and Electricity Co., Ltd.—This company, which has been formed from the old Farnham Gas Co. held its first ordinary general meeting last week, Mr. A. J. Nash presiding. He said that, owing to opposition from local authorities, they were put to the enormous expense of £2,100 in obtaining the Act incorporating the company and conferring powers to supply electricity. For the electric light undertaking, they had engaged the services of an engineer and he looked forward to seeing electric light in Farnham within 15 months. An extraordinary meeting followed, at which resolutions were passed sanctioning the creation and issue from time to time of additional capital and debenture capital as authorised under their new Act.

Bruce Peebles & Co., Ltd.

The annual general meeting of this company was held on February 17th, at Edinburgh, Mr. F. E. Andrews in the chair. In moving the adoption of the report, he said that the progress made during the year, though naturally gradual, had been considerable, and what was more important, continuous, as in spite of the great difficulties with which they had still to contend, they had consistently been moving in the right direction, and the weekly heavy loss which existed had been steadily reduced until now they might consider that it had practically entirely disappeared. Regarding the position of affairs with regard to the old company, the legacies left to them, both of an engineering and of a financial nature, were numerous, but all these had now been cleared up and finally settled to the entire satisfaction of both their customers and themselves. Many of these contracts were for work in distant parts of the world, and all communications and negotiations regarding them of necessity entailed the lapse of appreciable periods of time, therefore, the successful completion of all was very gratifying. It also had this great advantage, that now they had a clean sheet, and instead of spending part of their time in clearing up old matters, which, in the very nature of things could only be a source of expense without any compensation in the way of profit, they were now able to devote their whole time and energy to furthering the current work of the new company, knowing also that by the liberal attitude they took up with regard to the said contracts they had retained their old friends and gained the goodwill of many new ones. As to their legacies of a financial nature, these also had practically all been adjusted and settled on terms fair and equitable to all parties. Only three or four more claims now awaited the sanction of the Court for the liquidation of the old company to be finally disposed of and out of the way. So much for the past, which past, however, had borne very heavily on them during the first two years of the existence of the new company, and still to a large extent remained in the shape of a heavy capitalisation compared with the maximum possible output of their workshops. The accounts spoke for themselves. The debts owed by the company were just their ordinary monthly bills for materials, &c., and the debts due to them were over £20,000 more than those due by them, which was a healthy state of affairs. In addition they had over £20,000 in hard cash, so that their position in this respect was quite satisfactory. They had kept their plant and tools in a thoroughly efficient and up-to-date condition, and had made many improvements. In this way they had spent over £3,400; this, however, had not been added to capital, but had been charged to manufacturing account. Steadily pursuing the policy outlined at the last meeting, they had continued the overhaul of the designs of all their various classes of manufacture, and he did not know of any firm either at home or abroad able to turn out better electrical machinery than they were doing at the present time. This view was confirmed not only by the orders they were constantly receiving from old names on their books, but also by an ever-widening circle of new customers in all parts of the world. They had been engaged on the careful rearrangement of the staff, so as to obtain the best results from the work of all their officials and ensure a maximum of efficiency; these rearrangements had been satisfactory, so that the business was now proceeding in a manner that made for economy all round, especially in the cost of production. The executive officials, not only at the head offices and works, but also at their branches, had, following the example of the general manager (Mr. Lee Murray), put an amount of enthusiastic hard work into the past year which was most praiseworthy, and which was certainly encouraging as evidence of their belief in their ultimate prosperity. Their chief attention, however, had been directed to obtaining work, and although they had not yet arrived at the much desired stage of having their existing shops working at their full, and, therefore, their most economical capacity, they had nevertheless so far succeeded that the value of orders for the year under review was very much larger indeed than that of the previous year. To attain this end they had been constantly engaged on the improvement and enlargement of their selling organisation, both at home and abroad. In the home market their efforts to obtain work had met with fairly satisfactory results. The volume of orders to be placed had been greater than for some time past, but competition had been keener than he had ever known it. However, prices having ruled on such an inadequate basis in this country, they had given their most earnest attention to building up their business abroad. They sent one of their engineers on a journey during which he visited Canada, Australia, New Zealand, and South Africa, and the results had been entirely satisfactory, and orders were reaching them in increasing numbers from those countries. They had established agencies in all the four, and in view of the large amount of work in South Africa, they had sent one of their most capable engineers to reside there permanently, with his headquarters at Johannesburg. They had also made arrangements with regard to pushing their business in India and China, and were about to send an engineer to reside in the former country, and look after their interests there, with his headquarters at Calcutta. For Calcutta they had obtained the largest order for sub-station plant given out during the year. This order was obtained on merit and in competition, not only with British but also with Continental manufacturers, and showed the high estimation in which the machinery produced at their factory in Edinburgh was held. They would readily understand, however, that in order to prosecute their campaign in other lands, it had been necessary to spent an appreciable amount of money, but in times like the present it was the worst possible policy to economise in this direction, and unless they went out to get work they might rest assured it would not come to them of its own accord. He could not let the occasion pass without referring to the insane competition which still obtained among some of the electrical engineering firms of this country. Prices had for a long time ruled very low, due largely to the fact that there had not been a sufficiency of orders to fill the existing workshops. It was, however, quite beyond his comprehension why, even in these circumstances, manufacturers should think it desirable to continue the suicidal policy of undercutting each other on every possible occasion and take orders which not only meant no profit whatever, but often entailed a substantial loss. They themselves resolutely declined to take work at prices which they saw were obviously unremunerative. Competition from foreign firms was still severe, but he could not then discuss our so-called Free Trade, which would more correctly be designated "Fettered" Trade. Tariff Reform, admittedly, would help their particular industry considerably. He, therefore, profoundly regretted that it was always argued as a political question, instead of being considered on its merits from a purely commercial point of view. There was another thing that, in his opinion, was a great mistake—for several years now it had been the habit of some few people in Great Britain connected with engineering works to bemoan their sad lot, and say they were all bound before long to come to an untimely end. Could it be wondered at that many customers, hearing this perpetual plaint, were inclined to believe it, and were thus led to placing their orders with American or German firms who did not decry themselves and the goods they had to offer? It was pleasant, however, to remember that some of their leaders and chief trade journals had not allowed themselves to regard matters in this melancholy fashion, but had kept a stout heart all through. The electrical and allied industries had certainly been passing through a rather trying time, but the outlook was, in his opinion, much more propitious. A lot of work had been carried out in this country, but a far greater amount still remained to be done, and still greater opportunities existed in more distant lands for those who were prepared to take the initiative, and push with energy for business abroad. He felt convinced that their vigorous policy in this respect would, in due time, receive its full reward, and that it had their cordial approval. Their business, as the result of their two years' work, was now established on a thoroughly sound foundation. The present general trend was an improving one, and if, as he anticipated, this continued, he was sanguine enough to hope that the day was not far distant when they would be dealing with their maximum output at prices sufficiently remunerative to enable the business to be run on a profitable basis. He looked forward with confidence to the future.

In reply to a shareholder, the Chairman said that he was doubtful of the policy of reducing the number of directors or the fees paid to the directors. If they considered the amount of trouble and work given by the directors to assist to pull a company of this sort out of its difficulties, he did not think that the shareholders would wish to see any false economy in that direction.

Westminster Electric Supply Corporation, Ltd.

The directors' report for the year 1910 says that the supply of current, which on December 31st, 1909, was provided for the equivalent of about 32,500 kw., had increased by December 31st, 1910, to the equivalent of about 33,800 kw. The length of roadway in which continuous current mains have been laid now exceeds 88 miles, making about 351 miles of ways, into which upwards of 270 miles of copper (strip and cable) have been drawn. In addition six miles of trunk mains (35 miles of ways) are laid in the company's area to connect the stations with the Central Electric Supply Co.'s station at St. John's Wood. An agreement, which has received the approval of the Board of Trade, has been entered into with the London Electric Supply Corporation, Ltd., under the London Electric Supply Act, 1908, in connection with the working of that portion of the London company's undertaking which is situated in the joint area of supply. The agreement took effect as from June 30th, 1909, and the receipts and costs are included in the accounts. In order to provide capital for plant, mains, &c., for extension of the company's business, the directors in December last offered 28,721 £4 10s per cent. cumulative preference shares to the shareholders on the register. A large number of these have been taken up, and the rest will be issued as necessity arises. The directors have recently obtained from the Westminster Estate Board a new lease for 65 years of Eccleston Place premises and surrounding property. An interim dividend, at the rate of 10 per cent. per annum on the ordinary shares, and the dividend on the 4½ per cent. preference shares, for the half-year ending June 30th, 1910, have been distributed. After allowing for depreciation, sinking fund and other charges, the net balance is £49,546, from which must be deducted the second half-year's dividend on the preference shares, which absorbs £8,610, leaving a balance of £40,936. Out of this the board recommend the payment of a dividend at the rate of 10 per cent. per annum, less income-tax, for the past half-year, carrying forward £15,041. The following is a statement of electricity sold, &c.:—

Units sold to consumers	17,105,212
Used on works	384,031
Total	17,489,243
kw. on circuit, December 31st, 1910 ..	33,897

Bournemouth and Poole Electricity Supply Co., Ltd.—A final dividend of 6 per cent. per annum for the half-year ended December 31st, making 5½ per cent. for the year, less tax, is recommended. This is the same rate as for 1909.

Tyneside Tramways and Tramroads Co.

THE half-yearly meeting was held at Newcastle on 14th inst., Dr. J. Theodore Merz presided.

The directors reported that the surplus of receipts over expenses was £3,022, plus £644 brought forward. After deducting interest on debentures, loans, &c., amounting to £1,003, there remained an available balance of £2,662. After paying 5 per cent. on the preference shares and 1½ per cent. per annum on the ordinary, and putting £600 to reserve, they carried forward £456. The dividend on the ordinary was the same as for 1909. The traffic receipts, which showed a slight increase during the first half of the year, were during the second half seriously affected by the lock-out of the boilermakers, and showed an increase of only £140 as compared with the year 1909.

The CHAIRMAN stated that although in the first month of the second half-year there was an increase of about £200 in the traffic receipts, that had not been sustained owing to the local boilermakers' lock-out, and the consequent dislocation of the workmen's traffic. The traffic receipts had worked out at 7·95d. per car-mile, as against 8·01d. in the previous year. The cost per car-mile had been slightly less—5·81d., against 5·87d. in 1909. They had transferred £1,500 to the depreciation fund, and written £330 from the preliminary expenses, but they did not hope to be able to write off £1,800 in the same way next year, as the directors had agreed to order two new cars, at a cost of between £1,700 and £1,800. They would be of the same type as those already in use, and they were expected to bring in a very much increased return. They would have to be paid for out of revenue unless more shares were issued, and the directors did not intend to do that at present.

MR. HENDERSON seconded, and the report was adopted.

Metropolitan District Railway Co.

THE ninety-third ordinary half-yearly meeting of the shareholders of this company was held on February 9th at Westminster Palace Hotel, under the presidency of Lord George Hamilton.

The CHAIRMAN, in proposing the adoption of the report (see ELECTRICAL REVIEW, page 228), said that the working of the past half-year had been satisfactory. The capital authorised to be raised was £187,500, £175,000 of which was due to the partial capitalisation of the arrears of interest on the guaranteed 4 per cent. stock. The capital actually raised during the half-year, including the £175,000 he had referred to, was £231,000. The estimate for future capital expenditure was £200,000; £75,000 was for new rolling stock, and the remainder for the development of surplus lands and for general improvements on the system. During the half-year they had carried 36,500,000 passengers, an increase of 2,649,000 over the corresponding six months of the previous year. It was a record in passenger traffic, and showed an increase in percentage of 7·82. The passenger earnings amounted to £280,000, showing an increase of £19,200, equal to 7·4 per cent. The average receipt per passenger was 1·84d. The gross revenue for the half-year amounted to £300,800; an increase of £21,194, equal to an increase of 7·58 per cent. The expenses amounted to £150,500, showing a decrease of £2,081. The whole of the permanent way and the buildings had been well maintained, and the decrease in the working expenses was mainly due to the diminished cost of current. They proposed to pay a dividend for the half-year at the rate of 3½ per cent. on the first preference stock, and to carry forward £2,020. He congratulated the patient and long-suffering preference holders upon that dividend on their stock. The amount paid in the first half of the year was 3 per cent. which, together with the dividend now to be declared, made 3½ per cent. for the whole year. It was 10 years since they had received a dividend, the last being paid at the rate of 3 per cent. in 1900. He hoped that not only would the present rate of dividend be continuously paid, but that they would be able in a very short time to pay to the preference holders the full dividend to which they were entitled—4½ per cent. There were two Bills alluded to in the report which the company proposed to promote in Parliament, one of which required some explanation, and that was the Bill promoted by the District Co. for the purpose of acquiring possession of the power house at Lots Road, Chelsea, which was the property of the Underground Co. He thought it was a generally admitted maxim in business that where there was any large enterprise or any considerable number of persons who were consumers of an article, that they should, if possible, have some control over the manufacture and production of the article they used, and that was a maxim which was especially applicable to a railway enterprise. At present the whole of the current which was consumed by the District was supplied to them from a generating station at Chelsea, which was the property of the Underground Co., and they obtained their current under an agreement which was made some years back. That agreement ran for 99 years, and dated from 1904. Under that agreement they were bound, during the whole of that period, to take all the current they consumed from that generating station. The agreement was a very fair and reasonable one. They paid for the cost of the production of the current, plus a small profit, and they paid interest on the cost of the acquisition of the land and the buildings which which had been erected on it. The property was a very valuable one, and it might be that the Underground Co. might part with it and hand it over to someone else, and it might happen that those who came into possession might not be as friendly disposed towards them as were the present owners, because it was possible to conceive of contingencies under which, although they had their agreement behind them, they might not, perhaps, receive as generous and kindly treatment as they did at present from the Underground Co. It sometimes happened that the interests of the user and the producer were not identical. The consumer might wish to have certain improvements effected in the machinery and the method of production which would involve considerable outlay. The producer might not see his way to provide that outlay, but if the producer and the consumer were the same body, then the interests became identical. There was another reason which actuated them in urging the proposal. It was quite clear that as the railway company developed its operations and increased the number of its trains, it would require more current, and they might fairly assume that the more current there was consumed the greater would be the profit upon its production. The directors saw no reason why the railway itself which consumed the current should not obtain that increased profit. That was why the directors thought it advisable to see if they could acquire the property upon fair and reasonable terms; and if he was asked what he meant by fair and reasonable terms, he would say terms which would not place the company, after they had acquired the property, in a worse financial position than they were before. The next question which arose was, how was it possible to provide the necessary capital for the purchase of so valuable a property? At present the payment for current was part of the working expenses of the line, and the same was the case in regard to the London Electric Railway. If it were possible to make as security for any stock which had to be raised for the acquisition of the power house, the working charges, then the money could be obtained at a low rate of interest, and they would obtain partial possession of the property, and the debenture-holders and the prior lien holders would be in no way prejudiced by the operation. What they proposed to do was to incorporate a Joint Committee of the two railways, and to authorise them to purchase by agreement the power house from the Underground Co., and to lease it for 999 years to the two companies. The two companies would pay to the Joint Committee a rent, one moiety of which would be the working expenses of each railway company, which would be applied to the paying of the interest on the special stock which the Joint Committee would issue to provide the purchase money to pay the Underground Co. for the property. The London Electric Co. were partners in the contract, and the proposal was that each railway should pay a moiety of the sum necessary for the acquisition of the power house. Each railway company would be liable in the first instance for a moiety of the expenses, but the apportionment of the charge, and the expenses of working the power house would be regulated by the amount of current subsequently used by each railway. He wished to point out that at present the Bill was merely an enabling one. If it passed the House of Commons, it would be necessary to carefully consider the terms and conditions as to purchase, and it would then have to be submitted to each one of the three companies—that was the seller, and the two purchasing companies—and separate meetings of the shareholders of each company would have to sanction the agreement. The power house was very generously equipped, and at present the power consumed was considerably less than that which could be produced there. They had an implied right to supply current to the companies which were in physical connection with their line, and they proposed to make that certain by having that authority confirmed. They also proposed to take power to run omnibuses, cabs and other road vehicles, should they consider it necessary to do so in connection with their service. They had found that, at one or two outlying stations, such a provision would be of benefit to the company, but, of course, it was not a power that they would use at all largely. Another Bill which would be introduced into Parliament by the London Electric Railway Co. concerned them intimately, as part of the object of the Bill was to improve the facilities of interchange at Charing Cross. All who travelled by the Underground or the District would know that the interchange of connection at Charing Cross between the two tubes and the District was at present most inconvenient. There was an absolute hiatus between the Hampstead and Charing Cross line and the Baker Street line, and the physical connection between the Baker Street line and Charing Cross was very inconvenient. They hoped to effect such changes there as would place the three lines in direct and easy physical communication one with the other. Regarding the future prospects of the company, it had steadily improved during the past few years, and he saw no reason why their progress should not be satisfactory for years to come. The progress of a line such as theirs, from the conditions under which it was working, and the limitation which those conditions imposed, must necessarily be slow; but he thought the improvement, though slow, should be steady and continuous. They were purely a passenger line, and their capital for the length of their line was large, while the turnover in proportion to the capital was small. He might mention as an interesting fact that between South Kensington and the City they were now running 38 trains on each track per hour, and the manager hoped that when more of the new and improved cars were in work he would be able to increase the trains to 40 per hour. He looked with confidence to the future, because their external relations with all the companies with whom they came in contact, and with whom they had working agreements, were very satisfactory, and because the internal arrangements existing between the shareholders and the directors left nothing to be desired.

MR. H. W. BROWN seconded the motion.

MR. POWNALL asked whether the sole reason for the purchase of the Lot's Road power house was because of the remote contingency that it might at some future time pass into the possession of some other company? He thought there should be some more valid reason given them before they saddled themselves with that undertaking. It seemed to him that they were obtaining their current on extraordinarily advantageous terms already. He would like to know whether the proposal had been put before Sir George Gibb,

and whether he approved it or not? If he did, he (the speaker) would be inclined to withdraw any objection he had to the scheme.

Mr. Loveridge raised the question as to the electrification of the East London Railway. He said that the shareholders of that concern seemed to be waking up to the fact that something must be done to convert that derelict line into a paying concern.

The Chairman, in reply, said it was true that the East London Railway was not in a very flourishing financial position. The position was that there were six companies who had given certain guarantees in connection with it, and if the line was electrified the whole burden of the cost would fall upon those six companies. It might be desirable from the East London Co.'s point of view to electrify the road, but it was a matter which required very great consideration; and as far as the District Co. was concerned, he did not think it would be well for them to prematurely take upon themselves fresh responsibilities as regarded other lines. With reference to Mr. Pownall's remarks, he was afraid that that gentleman had not been impressed with his (the chairman's) speech, in which he thought he gave very good and cogent reasons for the acquisition of the Chelsea power house. It was always advantageous, where one was a consumer, that they should have control over the source of supply. As he had said, their arrangements for obtaining current were so far satisfactory, but there was no doubt that if they could get possession of the power house upon fair and reasonable terms—and the whole thing turned upon that—it would be an advantage to the company. Sir George Gibb was certainly of that opinion. The matter did not in substance assume its present shape while Sir George was chairman, so that he was not able definitely to express an opinion upon the scheme, but as far as he (the chairman) knew he was always in favour of it.

The report was then adopted.

Subsequently, at a special meeting, resolutions were unanimously agreed to approving of the Bills.

Liverpool Overhead Railway Co.

The half-yearly general meeting was held at Liverpool on February 14th.

Sir William Forwood presided over a large attendance, and in moving the adoption of the report (see Electrical Review, page 231), he said that there had been a slight improvement in the trade of the port, which was reflected in their earnings. They had carried 175,749 more passengers, which yielded an increased revenue of £1,049, and they had effected further small economies in working expenses, and in compensation, which amounted to £744. They recommended the payment of a dividend on the ordinary shares at the rate of 1½ per cent. per annum, leaving to be carried forward £4,246. In resuming the happy position of paying a dividend, which he hoped might be continuous, they had not neglected the upkeep of the undertaking, but had steadfastly adhered to their policy of maintaining its efficiency, and for this purpose had made, as usual, considerable payments out of revenue. Their railway, from the nature of its structure, would deteriorate if not carefully maintained, and its upkeep had always had first consideration, and it was to-day structurally in as good a condition as when opened 18 years ago. The through traffic arrangements with the Lancashire and Yorkshire Railway Co. did not show the expansion anticipated, and their agreement with them would require further consideration and re-adjustment. After referring to the effects of the competition of tramways and the electrified Liverpool and Southport Railway, he said that to hold the traffic they had had from time to time to reduce their fares; whereas in 1900 their earnings per passenger were 1·90d., last year they were only 1·71d. This represented a decrease in earnings of £6,433 based upon their traffic of last year. He was not sanguine that they would be able to advance the fares materially, and they must look for any improvement in earnings to the increase of traffic. They were doing better since the commencement of the year, and on Monday last week they carried their record number of working men. At the close of that meeting a Wharncliffe meeting would be held to enable them to promote a Bill in Parliament. Their debentures, amounting to £206,500, fall due in January, 1913. The object of this Bill was to enable the company to consolidate its debentures and to negotiate with the Dock Board. On the whole, the outlook was brighter than for some years past. With their continuous service of trains they required their men to be always on the alert, and their engineer and general manager (Mr. E. J. Neachell) had inspired them with an *esprit de corps* and an intelligent interest in their work.

Mr. G. H. Robertson seconded the adoption of the report.

In reply to questions, the Chairman said the renewal account was being added to (1) because the directors appreciated the advantage of keeping capital account in a strong position; (2) because the company's Seaforth and Crosby tramway base was not a long one, and the directors might have to write off some capital. The strong financial position of the company would assist the directors in their negotiations with the Dock Board.

The report was adopted unanimously.

Huelva Gas and Electricity Co., Ltd.—The directors report that the net profit for 1910 amounts to £2,964, plus £769 brought forward, making £3,733. They recommend a dividend of 4 per cent., free of income-tax, absorbing £1,000; and there is to be written off for depreciation of gas and electric plant £2,000, leaving £733 to be carried forward

London United Tramways, Ltd.

Mr. C. J. Cater Scott (Chairman) took the chair at the ninth ordinary general meeting of the above company held on Friday last week at Winchester House, E.C.

In proposing the adoption of the report (see Electrical Review, page 270), the Chairman first alluded to the death of Sir Clifton Robinson. With regard to the report and accounts, he thought they were not of an unsatisfactory character, and, indeed, he thought he could put it higher than this, seeing they were dealing with a year when the weather conditions were not favourable to tramway business, and during which there had been no diminution of the severe competition to which they had been subjected. Not only had they checked the diminution of the receipts, but they had increased them by £15,432, and increased the profits by £7,708. Whilst they might very naturally say this was not very good, still, he thought it was hopeful for the future, and might be taken as an omen of better times to come. The increase had been gained in spite of some interference with their traffic. Last year he told them of their intention to improve the permanent way and the rolling stock, and in connection with the former object they had found it necessary from time to time to work considerable lengths of the tramway as a single track, which had necessarily interfered somewhat with the traffic, and put them to extra operating expenses. These repairs, which were necessary, were by no means complete, but considerable progress had been made, and he thought the shareholders would benefit in the future by decreased operating expenses. For the whole course of their existence probably it would be necessary, following the programme they had sketched out, to put on one side a considerable amount for the purpose of keeping the track and rolling stock in an improved state of repair. He knew it might be charged against them that they ought to have made provision for this in the past, but as he told them last year, whilst they were engaged more or less on the work of active construction, they did not feel they could undertake the liability, and they had hoped that when the lines were complete the traffics would be so developed that they could have paid dividends and allowed for the proper maintenance of the lines. Circumstances had so changed, however, and particularly in regard to the motor-'bus competition, that they had not found this development, and consequently had not been able to make the provision they deemed advisable. This imposed a heavy burden on the shareholders, but it was a course they were bound to take. A factor in the improvement of their receipts had been the alteration in their system of fares. They had adhered to the penny fares, but had arranged them by divisions into sections. In 1909 they carried 56,877,000 passengers, whilst last year they carried 60,132,000, or an addition of 3,250,000, giving them an increase in receipts of £15,432. The earnings per passenger had remained practically the same, viz., 1·32d., against 1·34d. They had spent £8,000 from revenue in connection with the thorough overhauling and renovating of the cars, and undoubtedly this had also helped on the service. At the same time, they had added 60 cars with covered tops, and the charge for this had gone to the renewal account. In spite of this expenditure, he claimed that they were doing their best to run the tramways economically and efficiently, and as a proof he might say that the operating expenses this year were 70·81 per cent., against 71·47 per cent., which, while only ½ per cent. reduction, was satisfactory, considering the extra expenditure he had referred to. Under traction expenses they had made a saving of £988, although the car-mileage last year was 300,000 miles in excess of that of the previous year. Under traffic expenses there was a saving of £3,959, which, however, was to a certain extent illusory, as it arose chiefly from their having effected a large saving in the amount paid for compensation and the legal expenses connected therewith. The general expenses were up £2,678, but of that something over £2,000 was altogether exceptional, and was due to the board paying the salary for the year of the late Sir Clifton Robinson when he retired from the board. In maintenance and repairs there was an increase of £9,000 due to the overhauling and renovation of the rolling stock or to putting in new plant, which had resulted in diminished operating expenses. When they got to the net revenue account they would see that, after paying the debenture interest, and making provision for the income-tax they had a balance left of £30,814. Of that they proposed to allocate £30,000 to reserve for renewals, contingencies, &c., and carry forward £814. The reserve for renewals and contingencies, as shown in the balance-sheet, stood at £37,533, and would now be brought up to £67,532, and following out the programme which the directors had, after most careful consideration laid down, they believed it would be necessary year by year to add to that fund. He would like to say how much they owed to Mr. Stanley and his most able assistant, Mr. Knapp, for all they had done in connection with the company. He did not care to say too much in Mr. Stanley's presence, but all who worked with him realised that if anyone could bring the United Tramways to a better position for the shareholders it would be he. With regard to the question of the acquisition of the Hammersmith lines by the London County Council, his lips were sealed. They were carrying out negotiations with the L.C.C. of the greatest importance, which required to be handled with the greatest delicacy, and he hoped that the shareholders would accept it from him that the board were doing all they could in their interests, and would not ask him to disclose any information.

The Hon. Sydney Holland seconded the motion.

Mr. Lowe asked whether the proposed extension of the Tube Railway to Ealing would not affect the company.

The Chairman said they thought it would not injuriously affect them, but by helping to develop the district they hoped it would increase their traffics.

The motion was carried.

An extraordinary meeting was subsequently held, when a resolution was passed approving of the board promoting a Bill in Parliament. The Chairman explained that the Bill simply asked for a further 12 months in which to electrify the antiquated tramway from Kew to Richmond. At present they were carrying through some negotiations with the Richmond Corporation.

Yorkshire (West Riding) Electric Tramways Co., Ltd.

The directors' report, which was submitted at the meeting held at 31, Throgmorton Street, E.C., last Friday, showed that for the year ended December 31st, 1910, the operations, after providing for all expenses, including repairs and maintenance, resulted in a net income of £29,109, plus the balance brought forward, £9,654. This profit has been dealt with as follows:—Debenture interest (less income-tax) on 4½ per cent. stock, £11,653; debenture interest (less income-tax) on 6 per cent. bonds, £932; general reserve and depreciation, £7,259; capital expenditure paid out of revenue, £805; paving of permanent way, £4,500; acquisition of Lofthouse Park shares and expenditure, £4,135; amount written off preliminary expenses, £7,478; carried forward, £2,000. The number of passengers carried was 9,220,853, and the miles run 1,770,028, as against 8,817,229 and 1,771,635 respectively for the previous year.

Mr. Herbert S. Leon, who presided at the meeting, said that they had received from passengers £62,185, and including parcels and advertisements, a total of £63,219. After providing for all expenses, &c., there was £38,763 to be dealt with. Dealing with the various items in detail, the chairman said the board had spent more than they had actually intended on the paving account; but it would be remembered that they were carrying out a scheme of putting down granite setts where they had previously had macadam. Last year they treated 12,584 sq. yards at an average cost of 7s. 2d. a sq. yard, and he did not think anyone could say that they had not got value for money. They had some 89,000 more sq. yards to do. The board were seriously considering the question of establishing a sinking fund. The board had now acquired the whole of the shares in the Lofthouse Park Co. The tramway company under an agreement guaranteed 5 per cent. for five years on the shares of that undertaking, but having now acquired the whole of the company's shares, that item would in future not appear in the balance-sheet. The company got a considerable amount of traffic from the Park, but that did not appear in the accounts—it was an indirect profit. The total operating expenses were £31,789, equal to 4·310d. per car-mile run, which was highly satisfactory, when it was remembered that the average for tramway undertakings was 6·65d. The working of the business as a whole was 50·28d., or exactly half the receipts. It would be remembered that a few years ago the board had to raise some money by the issue of 6 per cent. bonds, redeemable by a draw each year. The whole of those bonds, in the ordinary course, would be wiped out by 1912, but the board had hopes of clearing them all off this year. The number of passengers carried during the past 12 months was 9,220,853, and the miles run to 1,770,028, as against 8,817,229 and 1,771,635 respectively for the previous year. Their relations with the various local authorities through whose districts they ran continued to be friendly. As to their prospects, he did not wish to say anything about their paying a dividend, but there was a glimmer of light in their financial darkness.

Mr. B. Newgass seconded the motion.

Replying to shareholders' criticisms that a dividend should be paid before the board withdrew all the 6 per cent. bonds, the Chairman said that the policy of the board was to pay its debts before considering the question of dividends.

The report was adopted.

Rees-Roturbo Manufacturing Co., Ltd.—The directors report that the profit of the year to October 31st, after paying interest charges and including £1,978 brought forward, is £6,519. In view of the necessarily heavy expenses incurred in establishing the Rees-Roturbo business, they do not propose to appropriate any of this amount to payment of dividend on the preference shares at this time, but to write £3,163 off preliminary expenses, and carry £3,456 forward. The year's trading was adversely affected by the continuance of the general trade depression, making it difficult to establish and extend markets for the company's new and patented apparatus, with the result that the first six months showed a considerable decrease in the amount of orders booked. The second six months showed a rapid and substantial recovery.

Giant's Causeway and Portrush Electric Tramway Co., Ltd.—The annual meeting was held in Portrush on the 10th inst., the Provost of Trinity College presiding. The directors' report showed increased receipts, but a reduction in the net profits, due to expenditure on cars and permanent way. The third-class passengers increased by 6,700; first-class decreased by 3,000. The engineer's report mentioned a projected extension of the tramway for the carriage of basaltic road metaling from the new quarries connection to Portrush Harbour, and an extra approach to the station. The report was adopted.

Shawinigan Water and Power Co., Ltd.—The report states (according to the *Financier*) that the total revenue for the year from all sources, including the premium on the last issue of common stock, has amounted to $991,000. After making provision for interest charges, operation and maintenance expenses, there remains a surplus of $410,100. Quarterly dividends at the rate of 4 per cent. per annum have been paid, and $85,000 has been transferred to reserve fund, while a further amount of $15,600 has been applied to contingent rebates, leaving a surplus of $23,100 to be carried forward. The usual sum of $50,000 has been credited to the sinking fund for the 5 per cent. consolidated mortgage bonds, the depreciation reserve has been increased by $30,000 from contingent fund, and there has been applied a sum sufficient to provide for any depreciation occurring in the other assets of the company. The gross income for the year shows an increase of $171,900, while the net revenue is higher by $86,000. Arrangements have been made whereby the Montreal Light, Heat and Power Co. will obtain its entire future supply of hydro-electric power from this company. The company's interest in the Montreal Light, Heat and Power Co. has been increased to 10,000 shares, and, as that undertaking is also a large shareholder in this concern, it has been decided that the Montreal Co. shall be represented on the board of the Shawinigan Co.

British Electric Transformer Co., Ltd.—The directors' report for the year ended December 31st, 1910, states that they consider the result satisfactory. The accounts show that after paying all manufacturing costs and expenses of administration there remains a net profit of £12,188, plus £1,254 brought forward, making the total available balance £13,441. The board recommend that there be placed to depreciation reserve £1,000; to reserve account £5,000; that a preference dividend of 6 per cent. be paid for the year £1,904, and a dividend of 6 per cent. on the ordinary shares (2½ per cent. of which was paid as an interim dividend on September 1st, 1910) requiring £4,164, carrying forward £1,373. In the previous year £1,000 was put to depreciation reserve, £4,000 to reserve, £1,267 was written off preliminary expenses, 5 per cent. was paid on the ordinary shares, and £1,254 was carried forward.

City of London Electric Lighting Co., Ltd.—The directors have decided, subject to completion of audit, to place £45,000 to reserve and £4,000 to dividend equalisation fund, and to recommend dividends of 12s. per share, being at the full rate of 6 per cent. per annum on the preference shares, and 14s. per share, being at the rate of 7 per cent. per annum, on the ordinary shares. On account of these dividends 6s. per preference share and 6s. per ordinary share was paid in August, 1910. After payment of the dividends and other appropriations there will remain about £27,000 to be carried forward. In the previous year the dividends were the same, £45,000 was put to reserve, £10,000 to dividend equalisation fund, and £24,000 carried forward.

Crossley Bros., Ltd.—The directors' report for the year ending December 31st, 1910, states that the amount to the credit of revenue account is £105,960, out of which a dividend has been paid on the preference shares at the rate of 5 per cent. per annum, and a dividend on the ordinary shares at the rate of 4 per cent. per annum for the first half of the year amounting to £21,491. It is proposed to pay a further dividend for the second half of the year at the rate of 5 per cent. per annum on the preference shares, and 6 per cent. per annum on the ordinary shares amounting to £27,194; to place £20,000 to the reserve fund, and to carry forward the balance of £37,275.

London Electric Wire Co. and Smiths, Ltd.—The directors, after reserving £1,000 against fall in market price of investments, placing £10,000 to reserve (making £15,000), and £2,388 to extinguish preliminary expenses, have declared a dividend of 7½ per cent. (7s. 6d. per share), less income-tax, on the ordinary shares for the half-year to December 31st, making 10 per cent. for the year, carrying forward £3,425.

Mansfield and District Tramways, Ltd.—The directors report that the profit for 1910, including the balance brought forward, is £9,257. It is proposed to transfer to reserve for depreciation, &c., £1,200, and to pay a dividend of 3 per cent. on the ordinary shares, carrying forward £447.

Continental.—Hungary.—Messrs. Ganz & Co., the well-known electrical engineering concern of Buda Pesth, are increasing their capital from 4,360,000 to 8,200,000 crowns, with the object of acquiring and carrying on the Danubius Shipbuilding and Engineering Co., of the same city.

STOCKS AND SHARES.

Tuesday Evening.

Business in the Stock Exchange continues to show a fair amount of expansion, and the fillip which has been given to investment by the renewed attention drawn to Home Railway stocks is making its influence felt in many departments, besides those immediately affected. The demand for Electricity Supply shares is still noticeable, in spite of a batch of dividends and reports which must be

regarded as slightly disappointing in the light of what seemed possible two or three months ago. At the same time, there is a growing confidence in the future of the industry, and the way in which some of the low-priced manufacturing shares have responded to a very little buying, affords clear indication of the greater readiness on the part of the public to follow the upward tendencies which have been inaugurated.

The Home Railway market is still by far the most popular in the Stock Exchange, and the rises on the week in Steam stocks have been substantial. Owing to the reduction of the Bank Rate last Thursday to 3½ per cent., carry-over rates this week are again lighter, and the public are taking advantage of this in order to make fresh purchases for the March settlements. The buoyancy has extended to Electrical Railway issues, amongst the most satisfactory of which are the rises in the Central London trio. Attention has been drawn to these for several weeks past, and already there have been fair advances in each of the three stocks mostly dealt in in the market. It seems, moreover, that the improvement will go further, and the Preferred stock must be regarded as an excellent investment of its kind in view of the yield which it still returns, while the Deferred, of course, has more possibility, considered as a speculative counter. City and South London is again in demand, and the price put on a point to 29¼. East Londons are again popular, the Ordinary stock rising to 5⅝, and the Debenture stocks all being several points better. Of the Undergrounds, the principal feature is the strength of Metropolitans, but Districts have also hardened. Almost the only issue in this market which has not moved during the recent railway boomlet is Great Northern and City Railway Preferred. Waterlogged and hopeless as the case for the company appears to be, it cannot be supposed that the line will be allowed to sink into oblivion, and it is quite possible that these £10 shares at something under a sovereign are worth putting away just as a gamble.

There has been a remarkable rumour to the effect that the London and North-Western Railway Company has recently invited tenders for the supply of electric current for its new branch to Watford, which is to be opened for electric working probably next year, and the report went so far as to say that the Metropolitan Electric Supply Company has secured the contract. We believe that there is no immediate truth in the rumour, but it may prove intelligent anticipation of what may happen some time hence. Nevertheless, it is interesting as pointing the way to what is bound to happen in the case of not only the North-Western, but other big lines, when they grapple with the problem of electrifying their suburban systems, a problem whose practical solution is brought the nearer by the rise in Home Railway stocks, which will have the effect of giving the companies better opportunities for raising fresh capital than they have had for many years past.

Amongst the movements in the accompanying price-lists, the most substantial is the jump in National Telephone Deferred stock, which comes on the top of a heavy rise since the beginning of the year. This movement has been accompanied by gains in the Preference shares of the company, and keen wits are at work to analyse the probable position at the end of this year, when the arbitrators get to work to value the company's undertaking before it is handed over to the Post Office. Where so much is a matter of guess-work, there is certain to be disappointment, so too much reliance cannot be placed upon the figures which are estimated by various authorities, one of whom puts the value of the Deferred Stock at 150, the price to which it will be seen the market value has already nearly approximated. This has been the principal feature of the Telegraph and Telephone Market during the past week, other movements being limited to small fractions either way. Further profit-taking has reduced West India and Panama shares, and Anglo "A" continues a weak market, while the Preferred stock is slightly down. On the other side occurs a small rise in Globe Telegraph and Trust Ordinary shares.

The electricity supply list shows an almost unbroken catalogue of rises. City of London Ordinary lost ½ on the declaration of the same dividend as before, whereas an extra distribution had been looked for in the market. Metropolitan Ordinary changed hands at 4⅞, but came back to 4½. After this the alterations in the London prices are all in the upward direction, and the undertone of the market keeps extremely firm, while the remaining dividend announcements are looked for with considerable interest. In the manufacturing shares, Electric Construction Preference went back ¼ on the consideration that shares stand quite high enough for the moment, but Edison & Swan shares have enjoyed a big jump, the demand being more particularly for the fully-paid "A" shares. These last have gone from 22s. to £2, and the partly-paid "A" shares rose from 8s. 9d. to 12s. 6d., comparing with about a couple of shillings a few weeks ago. In sympathy with this, the Company's 4 per cent. Debenture stock rose 2½, and the 5 per cent. Second Debenture stock gained 1, still showing a yield of rather over 6 per cent. on the money. General Electric 4 per cent. Debenture went up 5½ on quite a small demand. There has been eager inquiry for Brush Electrical issues. Both Debenture stocks rose 5 points, and the shares are also decidedly better. Babcock & Wilcox rose ¼ on the impression that the Navy estimates will show a big increase.

British Electric Tractions have receded after their rises, and London United Trams Preference went back to 2¼, although the Debenture stock improved. Anglo-Argentine Preference are firm. Mexico Trams lost part of their recent buoyancy, and Rio Trams at 110¾ are well below the best price lately touched. Mexican Light and Power issues are rather irregular.

The rise in raw rubber goes on steadily and surely. At 7s. per lb., at which the product has been changing hands to-day, the price is 2s. 2d. above what it was a few weeks back, but rubber shares are unresilient—if there be such a word—and the market in the shares verges towards stagnation.

ELECTRIC TRAMWAY AND RAILWAY TRAFFIC RETURNS.

Locality.	Fortnight ended.	Receipts for the fortnight. £	Receipts for the fortnight. £*	No. of wks.	Total to date. £	Total to date. £*	Route miles open.	Inc.
Aberdeen	Feb. 15	2,495	+ 131	37	52,485	+ 1,317	..	..
Ayr	„ 18	360	..	40	12,201	+ 444	8	..
Bath	„ 15	1,238	— 45	7	4,475	— 115	..	..
Belfast	„ 17	7,954	+ 453	46	189,190	+12,849	37	..
Birkenhead	„ 19	1,995	+ 30	46	50,783	+ 971	13·68	..
Birmingham Corp.	„ 11	13,522	— 210	45	312,406	+ 8,163	56·79	..
Blackburn	„ 15	1,871	+ 63	47	49,281	— 901	14·12	..
Blackpool Corp.	„ 16	752	+ 2	..	53,685	+ 698	..	..
Blackpool-Fleetw'd	„ 18	456	+ 41	7	1,662	+ 158	..	..
Bolton	„ 12	4,387	+ 48	46	108,424	+ 2,272	26	..
Bournemouth	„ 15	2,487	— 270	46	80,880	+ 4,973	21·95	..
Bradford	„ 11	9,528	+ 359	45	231,247	+10,894	54·81	..
Brighton	„ 19	1,402	— 56	46½	44,776	+ 877	9·5	..
Bristol	„ 17	10,583	+ 41	..	..	..	..	..
Brit. Elec. Trac. Co.								
Airdrie	„ 10	406	— 9	6	1,251	+ 12	3·65	..
Barnsley	„ 10	336	+ 12	„	949	+ 28	..	..
Barrow	„ 10	445	— 20	„	1,262	+ 11	5·37	..
Cavehill	„ 10	120	+ 13	„	338	+ 45	..	..
Devonport	„ 10	817	+ 33	„	2,444	+ 77	8·85	..
Gateshead	„ 10	1,983	+ 151	„	5,722	+ 351	11·25	..
Gravesend	„ 10	335	— 7	„	1,001	— 23	6·5	..
Greenock	„ 10	1,141	+ 183	„	3,431	+ 609	7·25	..
Hartlepool	„ 10	405	+ 9	„	1,189	+ 41	6·72	..
Kidderminster	„ 10	161	+ 5	„	469	+ 10	..	..
†Leamington	„ 10	282	— 18	„	732	— 47	..	..
Merthyr	„ 10	356	— 9	„	1,017	— 28	2·9	..
Metropolitan	„ 10	14,410	+8,217	„	42,867	+ 6,579	22	..
Middleton	„ 10	547	+ 69	„	1,601	+ 199	8·5	..
Mid. Joint Com'tee	„ 10	10,945	+ 89	„	32,325	+ 1,271	..	..
Oldham—Ashton	„ 10	1,004	+ 39	„	2,948	+ 157	9·13	..
Peterborough	„ 10	190	+ 7	„	551	+ 21	5·31	..
Potteries	„ 10	3,527	+ 188	„	10,628	+ 928	29	..
Rothesay	„ 10	74	+ 6	„	254	+ 7	2·75	..
Southport	„ 10	418	— 14	„	1,275	+ 80	8·17	..
S. Metropolitan	„ 10	1,290	— 23	„	3,885	— 47	..	..
Swansea	„ 10	1,958	+ 97	„	5,953	+ 412	12·5	..
Tynemouth	„ 10	273	+ 19	„	841	+ 49	3·75	..
Weston-s-Mare	„ 10	35	— 15	„	91	— 57	3	..
†Worcester	„ 10	413	— 41	„	1,304	— 29	5·75	..
Wrexham	„ 10	164	+ 7	„	496	+ 14	..	..
Yorks. Wool. Dist.	„ 10	1,989	+ 231	„	5,784	+ 711	17	..
Miscellaneous	„ 10	382	+ 23	„	1,097	+ 52	..	..
Burnley	„ 18	2,382	+ 54	..	..	..	11·73	1
Burton-on-Trent	„ 19	476	— 19	46	12,579	+ 273	6·72	..
Bury	„ 19	2,161	+ 129	46⅞	54,276	+ 1,063	22·5	..
Cardiff	„ 18	4,081	+ 44	47	101,395	+ 1,907	..	..
Carlisle	..	..	..	..	..	..	..	..
†Chatham and Dist.	„ 16	1,471	+ 4	7	5,016	— 94	15	..
Cork	„ 16	799	— 46	7	2,760	— 169	9·89	..
†Croydon	„ 10	1,458	+ 14	..	75,149	+ 3,317	11·25	..
Darlington	„ 18	374	+ 10	47	9,402	+ 773	..	..
Darwen	„ 17	454	+ 9	46	11,454	+ 73	4·36	..
†Dover	„ 11	157	— 15	45	9,916	+ 497	4·75	..
Dublin	„ 17	9,906	— 86	..	84,248	+ 243	54·25	..
Dundee	„ 15	2,167	— 97	39⅝	47,182	+ 506	15	..
East Ham	„ 18	1,864	— 15	46⅝	47,920	+ 2,032	7·87	..
Exeter	„ 17	49	— 39	46	14,687	— 645	5·5	..
Glasgow	„ 18	35,901	+1,108	..	672,198	+39,481	97·75	3·25
Hastings	„ 20	1,331	— 43	..	..	..	..	..
Huddersfield	..	..	..	..	..	..	..	..
Hull	„ 18	5,450	+ 114	46	128,231	+ 6,303	14·5	..
†Ilkeston	„ 16	113	— 4	46	5,868	— 210	..	..
Ipswich	„ 18	627	— 12	46	19,219	+ 992	10·5	..
Kilmarnock	„ 18	279	+ 10	40	6,091	+ 263	4·25	..
Lancashire United	„ 15	2,308	— 74	7	7,911	+ 139	39	..
Leeds	„ 11	13,228	+ 196	45	319,054	+11,947	57	..
Leicester	..	..	..	..	..	..	..	..
Leith	„ 18	1,028	— 43	40	23,854	+ 97	8·72	..
Liverpool	„ 11	20,595	— 342	6	64,004	+ 1,419	116	6·5
‡L.C.C.	„ 8	79,073	+4,367	..	1,875,456	+195,151	132·2	2·75
London United	„ 18	10,369	— 134	7	36,135	— 208	..	..
Lowestoft	..	..	..	..	..	..	..	..
Manchester	„ 18	29,346	+ 227	46	713,741	+23,325	183	..
†Newcastle	„ 18	3,918	+ 92	..	183,152	+ 1,902	14·5	..
Newport	„ 11	1,205	— 23	46	30,784	+ 1,117	14·5	..
Oldham	„ 19	5,669	+ 224	47	86,711	+ 2,332	23·5	·5
Pontypridd	..	..	..	..	..	..	..	..
Portsmouth	„ 11	3,009	— 195	45	91,813	— 1,506	15·25	..
Preston	„ 15	1,269	— 118	46	33,469	— 423	..	..
Rotherham	..	..	..	..	..	..	..	..
Salford	„ 6	3,796	+ 619	44½	208,285	+ 5,923	..	..
Sheffield	„ 21	12,058	+ 693	47⅞	266,667	+18,195	40	..
Southampton	„ 8	1,893	— 40	45	49,409	+ 1,424	..	..
Southend-on-Sea	„ 15	710	+ 5	46	26,302	+ 2,783	..	..
South Shields	„ 18	1,085	— 1	46⅛	25,921	+ 40	..	..
Swindon	„ 15	257	..	..	6,573	+ 309	..	..
Tyneside	„ 15	777	+ 63	7	2,475	+ 147	..	..
Wallasey	„ 4	1,679	+ 217	45⅞	42,454	+ 1,997	..	..
Walthamstow	„ 18	1,182	+ 45	46	32,291	+ 2,151	9	..
West Ham	„ 9	4,572	+ 128	45	111,743	+ 5,788	15·25	..
Wolverhampton	„ 15	1,714	— 8	46	43,268	+ 4,114	14·25	..
Cen. London Rly.	„ 18	10,500	— 605	7	38,068	— 846	6·22	..
City & S. Lon. Rly.	„ 19	6,751	+ 104	7	24,486	+ 1,046	7·26	..
Dublin-Lucan Rly.	„ 17	218	+ 1	7	692	+ 19	7	..
G.N. and City Rly.	„ 18	3,155	+ 101	7	11,141	+ 310	3·5	..
L'pool Overh'd Rly.	„ 19	2,722	+ 153	..	9,623	+ 674	6·8	4·3
Llandudno-Col. Bay	„ 3	220	+ 20	9½	1,097	+ 20	..	..
London Elec. Ry. Co.	„ 18	27,845	+1,855	7	99,780	+ 5,515	21·5	..
Mersey Railway	„ 18	3,950	+ 79	7	14,198	+ 364	4·5	..
Metropolitan Rly.	„ 19	33,586	+ 785	..	119,281	+ 3,349	24·5	..
Met. District Rly.	„ 18	23,619	+1,963	7	82,528	+ 6,762	24	..
Anglo-Argentine	„ 18	98,445	+13,698	..	341,805	+44,437	..	..
§Auckland	Jan.	18,059	+2,174	..	109,998	+11,537	23·3	1
Bombay (B.E.T.)	„ 20	5,621	+ 186	3	8,343	+ 200	..	..
Brisbane	..	..	..	..	..	..	..	..
Brit. Columbia Rly.	..	..	..	..	..	..	..	..
Calcutta	Feb. 18	7,283	+ 33	..	..	..	..	..
Cape Electric T. Ld.	..	..	..	..	..	..	..	..
§Kalgoorlie, W.A.	Jan.	3,244	..	..	..	..	20·5	..
§Lisbon	Dec.	1,699	+ 120	..	33,020	+ 1,510	..	..
Madras	Jan. 31	1,502	+ 33	..	3,161	+ 268	..	..
§Montevideo	Jan.	31,945	+2,643	18	82,705	+ 6,410	..	..
†Perth (W.A.)	Feb. 17	3,292	+ 179	..	11,571	+ 494	29	1

* Compared with the corresponding period of 1910. † One week only.
‡ Includes horse, steam and other receipts. One month.

SHARE LIST OF ELECTRICAL COMPANIES.

TELEGRAPH AND TELEPHONE COMPANIES.

Present Issue.	NAME.	Stock or Share.	Dividends for the last four years. 1907.	1908.	1909.	1910.	Closing Quotations Feb. 14th.	Closing Quotations Feb. 21st.	Business done week ended Feb. 21st, 1911. Highest	Lowest.	Rise + or Fall —	Present Yield per cent. £ s. d.
300,000	Amazon Telegraph Co.'s shares, Nos. 1 to 25,000	10	Nil	Nil	Nil	..	5⅜ — 6¼	5⅜ — 6¼	..	..	..	Nil.
$263,244,000	Do. 5 % Deb. Red. Iss. at 98 % script all paid	Stock	5 %	5 %	5 %	5 %	96 — 98	96 — 98	..	..	..	5 2 0
$255,196,000	American Telephone & Telegraph, Cap Stock ..	$100	8 %	8 %	8 %	..	149 —151	149 —151	149½	..	..	5 6 0
$53,000,000	Do. Collat. Trust, 4% Bonds, 1 to 28,000 and 53,001 to 78,000	$1000	4 %	4 %	4 %	4 %	93 — 95	93 — 95	..	..	..	4 4 3
545,920	Anglo-American Telegraph	Stock	3½%	£3 4s.	3⅜%	3⅜%	67½— 69½ xd	67½— 69½	67⅜	..	..	5 7 11
3,227,040	Do. do. 6 % Pref.	Stock	6 %	6 %	6 %	6 %	111½—112½ xd	111 —112	112	110⅝	..	5 6 11
3,227,040	Do. do. do. Deferred	Stock	1 %	8/-	25/-	30/-	26⅜— 26⅝ xd	26⅜— 26⅜	26⅜	25⅜	..	5 13 2
47,725	Anglo-Portuguese Tel., 5 % Mort. Deb. Stock Red.	100	5 %	5 %	5 %	5 %	102 —104	102 —104	..	..	..	4 16 2
44,000	Chili Telephone, Nos. 1 to 44,000	5	8 %	8 %	8 %	..	7 — 7¼	7 — 7¼	7⅝	..	..	5 10 4
2,462,309	Commercial Cable, Sting. 500 year 4% Deb. Sk. Red.	Stock	4 %	4 %	4 %	4 %	86 — 88	86 — 88	87	..	..	4 10 11
16,000	Cuba Telegraph	10	6 %	6 %	6 %	..	9 — 9¾	9 — 9¾	9⅛	..	..	6 3 1
6,000	Do. 10 % Pref.	10	10 %	10 %	10 %	..	17 — 18	17 — 18	..	..	..	5 11 1
12,931	Direct Spanish Telegraph, Ord.	5	4 %	4 %	4 %	..	3¾— 4	3¾— 4	..	..	..	5 0 6
6,000	Do. do. 10 % Cum. Pref. ..	5	10 %	10 %	10 %	10%	8¼— 8¾	8¼— 8¾	..	..	..	5 14 3
30,000	Do. do. 4½ % Debs.	50	4½%	4½%	4½%	4½%	99½—101½	99½—101½	..	..	..	4 8 8
60,710‡	Direct United States Cable	20	4½%	4½%	4 %	5 %	15⅝— 16⅛	15⅝— 16⅛	16	15⅞	..	6 4 8
32,500	Direct W. India Cable, 4½% Reg. Deb., 1 to 1,200, R.	100	4½%	4½%	4½%	4½%	99 —101	99 —101	..	..	..	4 9 1
4,000,000	Eastern Telegraph, Ord. Stock	Stock	7 %	7 %	7 %	..	135 —138	135 —138	137	135½	..	5 1 5
2,000,000	Do. 3½ % Pref. Stock	100	3½%	3½%	3½%	3½%	84 — 86	84 — 86	84½	..	..	4 1 5
1,896,706	Do. 4 % Mort. Deb. Stock Red. ..	Stock	4 %	4 %	4 %	4 %	100½—102½	100½—102½	101½	100⅞	..	3 18 1
300,000	Eastern Extension, Australasia, and China Tele.	10	7 %	7 %	7 %	..	13½— 13¾	13½— 13¾	13⅝	..	..	5 1 10
752,400	Do. 4 % Deb. Stock	Stock	4 %	4 %	4 %	4 %	99 —101	99 —101	99½	..	..	3 19 3
200,000‡	East. & S. Afric. Tel., 4 % Mt. Db. Mauritius Sub.) 1 to 8,000	25	4 %	4 %	4 %	4 %	100½—102½	100½—102½	..	..	..	3 18 1
181,127	Globe Telegraph and Trust	10	5⅞%	5⅞%	5⅞%	..	10⅛— 10⅜	10⅛— 10⅞	10⅜	10 17/32	+ ⅛	5 5 9
181,127	Do. do. 6 % Pref.	10	6 %	6 %	6 %	..	13⅛— 13⅜	13⅛— 13⅜	13 7/16	..	..	4 8 1
150,000	Great Northern Telegraph, of Copenhagen.. ..	10	20 %	18 %	18 %	..	32 — 33	32 — 33	..	..	..	5 9 1
17,000	Indo-European Telegraph	25	13 %	13 %	13 %	..	56 — 58	56 — 58	57⅜	56½	..	5 16 5
$41,380,400	Mackay Companies Common	$100	4 %	4 %	4½%	5 %	94 — 97	94 — 97	..	..	..	4 7 8
$50,000,000	Do. do. 4% Cum. Pref.	$100	4 %	4 %	4 %	4 %	77 — 79	77 — 79	..	..	..	5 1 3
394,190	Marconi's Wireless Telegraph	1	Nil	Nil	Nil	..	13/16— 15/16	13/16— 15/16	17/6	16/6	..	Nil
72,680	Monte Video Telephone Co., Ltd. Ord.	1	6 %	6 %	6 %	..	1/16— 1/8	1/16— 1/8	..	..	..	6 0 0
86,492	Do. do. do. 5 % Pref. ..	1	5 %	5 %	5 %	5 %	29/32— 30/32	29/32— 30/32	..	..	..	5 11 1
2,225,000	National Telephone, Pref. Stock	100	6 %	6 %	6 %	6 %	107 —108	107 —108	107⅞	107	..	5 11 1
3,725,000	Do. do. Def. Stock	100	6 %	6 %	6 %	6 %	137 —139	143 —145	145⅞	138⅞	—¼	4 2 9
15,000	Do. do. 6 % Cum. 1st Pref.	10	6 %	6 %	6 %	6 %	10½— 10¾	10½— 11	..	..	+ ⅛	5 9 1
15,000	Do. do. 6 % Cum. 2nd Pref.	10	6 %	6 %	6 %	6 %	10¾— 11⅛	10¾— 11⅛	..	..	+ ⅛	5 6 8
250,000	Do. do. 5 % Non-cum. 3rd P., 1 to 250,000	5	5 %	5 %	5 %	5 %	6 — 6⅛	6½ — 6⅝	6⅝	6	+ ¼	3 16 11
2,000,000	Do. do. 3½ % Deb. Stock Red. ..	Stock	3½%	3½%	3½%	3½%	98 —100	98 —100	98¼	..	..	3 10 0
1,983,593	Do. do. 4 % Deb. Stock Red.. ..	100	4 %	4 %	4 %	4 %	98 —100	98⅝—100½	98¼	..	+ ⅛	3 19 7
179,313	Oriental Telep. and Elec. 1 to 171,504, fully paid..	1	8 %	8 %	8 %	..	1¼— 1⅜	1⅜— 1⅜	32/6	..	— 1/8	4 11 5
50,000	Do. do. do. 6 % Cum. Pref. ..	1	6 %	6 %	6 %	..	1 3/16— 1 5/16	1 3/16— 1 5/16	..	..	..	4 7 3
195,955	Do. do. do. 4 % Red. Deb. Stock..	100	4 %	4 %	4 %	4 %	87 — 89	87 — 89	88⅛	..	..	4 9 11
99,400	Pacific & European Tel., 4 % Guar. Debs., 1 to 1,000	100	4 %	4 %	4 %	4 %	97½ — 99½	97½ — 99½	..	..	..	4 0 5
11,839	Reuter's	8	5 %	5 %	5 %	..	7⅜ — 8	7⅜ — 8	..	..	..	5 0 0
145,955	Telephone Co. of Egypt, 4½ % Deb. Red.	100	4½%	4½%	4½%	4½%	96½ — 98½	96⅝ — 98½	..	..	..	4 11 5
2,992	Submarine Cables Trust..	Cert.	6 %	6 %	6 %	..	133 —136	133 —136	..	..	..	4 8 3
150,000	United River Plate Telephone	5	8 %	8 %	8 %	..	7¼— 7⅜	7¼— 7⅜	7 15/32	7 11/32	..	5 6 8
40,000	Do. 5 % Cum. Pref., Nos. 1 to 40,000	5	5 %	5 %	5 %	5 %	5¼— 5⅜	5⅜— 5⅝	..	..	— ⅛	4 7 11
30,008	W. Coast of America, 1 to 30,000 & 53,001 to 53,008	2½	2½%	2½%	2½%	..	1¼ — 1½	1¼ — 1⅜	..	..	..	4 3 4
150,000	Do. 4 % Debs., 1 to 1,500 guar. by Braz. Sub. Tel.	100	4 %	4 %	4 %	4 %	97½ — 99½	97½ — 9	..	..	..	4 0 5
207,930	Western Telegraph, Ltd., Nos. 1 to 207,930 ..	10	7 %	7 %	7 %	..	13⅝— 14⅛	13⅝— 14⅛	13¾	..	..	4 19 1
800,000	Do. do. 4 % Deb. Stock Red. ..	100	4 %	4 %	4 %	4 %	99½—101½	9 —101½	..	..	..	3 18 10
88,321	West India and Panama Telegraph	10	Nil	Nil	Nil	..	2⅛— 2⅜	2⅛— 2⅜	47/3	45/-	— 5/16	Nil
34,563	Do. do. 6 % Cum. 1st Pref.	10	6 %	6 %	6 %	6 %	10 — 10⅜	10 — 10⅜	10¼	..	..	5 14 3
4,669	Do. do. 6 % Cum. 2nd Pref.	10	£2 6	15 %	14½%	..	8¾— 9¼	8¾— 9¼	..	..	..	6 9 9
80,000‡	Do. do. 5 % Debs., Nos. 1 to 800 ..	100	5 %	5 %	5 %	5 %	101 —103	101 —103	..	..	..	4 17 1

ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.

640,000	Anglo-Argentine Trams, 5% Cum. 1st Pref. 1 to 640,000	5	..	..	5 %	..	4⅞ — 5⅛	4⅞ — 5⅛	5⅛	99/4½	..	4 17 7
500,000	Do. 5 % 2nd Pref., 800,000 to 1,300,000	5	..	..	5 %	..	4 1/16— 4 3/16	4 1/16— 4 3/16	94/4½	93/1½	..	5 3 11
4,465,674	Do. 4 % Deb. Stock	Stock	..	4 %	4 %	4 %	94 — 93½	92 — 93½	93	92⅜	..	4 5 7
329,002	Auckland E. Trams, 5 % 1st Mort Deb. Stock ..	100	5 %	5 %	5 %	5 %	102½—104½	102⅝—104½	..	..	..	4 15 8
830,000	Babcock & Wilcox, 1 to 830,000	1	20 %	20 %	24 %	..	5⅝— 5⅞	5⅝— 6⅛	6 3/32	5 25/32	+ ⅛	4 0 0
100,000	Do. do. 6 % Cum. Pref., 1 to 100,000 ..	1	6 %	6 %	6 %	..	1⅜— 1½	1⅜— 1½	..	..	..	4 0 0
600,000	British Columbia E. Rail Def. Ord. Stock ..	100	8 %	8 %	8 %	..	145 —148	145½—148½	146½	..	+ ½	5 7 9
600,000	Do. Pref. Ord. Stock	100	5 %	6 %	6 %	..	125 —129	125½—128½	126⅝	..	..	4 8 6
600,000	Do. 5 % Cum. Perp. Pref. Stock	100	5 %	5 %	5 %	..	110 —113	109½—112½	110 3/4	109½	— ½	4 8 11
230,800	Do. 4½ % 1st Mort. Deb., 1 to 6,250	40	4½%	4½%	4½%	4½%	102½—104½	102 —104	102½	..	— ⅜	4 6 7
210,600	Do. 4½ % Vancouver Power Debs., 1 to 2,200	100	4½%	4½%	4½%	4½%	102 —105	102 —105	..	..	..	4 5 9
133,301	British Electric Traction	10	Nil	Nil	Nil	..	1⅛— 2⅜	1⅛— 2 1/16	42/6	36/6	..	Nil
161,437	Do. do. 6 % Cum. Pref.	10	3 %	1½%	Nil	..	4⅛— 5⅜	4¼— 5	5⅛	92/6	—3/16	Nil
1,473,653	Do. do. 5 % Perp. Deb. Stock ..	Stock	5 %	5 %	5 %	..	93 — 98	93 — 98	96	95	..	5 2 0
528,936	Do. do. 4½ % 2nd Deb. Stock Red.	100	4½%	4½%	4½%	4½%	75 — 80	75 — 80	76⅛	..	..	5 12 6
100,000	British Insulated and Helsby Cables	5	10 %	10 %	10 %	..	7 — 7⅛	7 — 7⅛	7⅛	..	..	6 13 4
100,000	Do. do. 6 % Cum. Pref.	5	6 %	6 %	6 %	..	5⅜— 6¼	5⅜— 6¼	..	..	..	4 16 0
500,000	Do. do. 4½ % 1st Mort. Deb. Red...	100	4½%	4½%	4½%	4½%	100 —102	100 —102	..	..	..	4 8 3
201,579‡	British Thomson-Houston 4½ % 1st Mort. Debs. ..	100	4½%	4½%	4½%	4½%	98 —101	98 —101	..	..	..	4 9 1
500,000	British Westinghouse 10 % Pref., 1 to 200,000 and 275,001 to 575,000 Non-cum.	5	Nil	Nil	Nil	..	⅝— ¾	⅝— ¾	..	..	..	Nil
1,241,353	Do. do. 4 % Mort. Deb. Stock ..	100	4 %	4 %	4 %	4 %	55 — 58	55 — 58	57½	..	..	6 17 11
50,000	‡Browett, Lindley & Co., Ord.	1	Nil	Nil	Nil	..	7/16— 9/16	7/16— 9/16	..	..	..	Nil
50,000	Do. do. 6 % Cum. Pref.	1	Nil	Nil	Nil	..	14/6 to 15/6	14/6 to 15/6	..	..	..	Nil
140,838	Brush Electrical Engineering, Ord., 1 to 140,338 ..	2	Nil	Nil	Nil	..	0 — ⅛	1/16— 1/8	..	..	+ ⅛	Nil
199,835	Do. do. Non-cum. 7 % Pref... ..	2	Nil	Nil	Nil	..	1/32— 3/32	1/8 — 1/8	..	..	+ 1/16	Nil
125,000‡	Do. do. 4½ % Perp. Deb. Stock ..	Stock	4½%	4½%	4½%	4½%	40 — 45	45 — 50	..	..	+5	9 0 0
125,000‡	Do. do. 4½ % Perp. 2nd Deb. Stock..	Stock	4½%	4½%	4½%	4½%	28 — 32	33 — 38	..	..	+5	11 16 10
137,610	Calcutta Trams, 1 to 137,610	5	6 %	4½%	4½%	..	5⅛— 5⅜	5⅛— 5⅜	5⅜	5⅛	..	4 0 0
47,295	Do. 5 % Cum. Pref., 1 to 47,295 ..	5	5 %	5 %	5 %	..	4⅛— 5⅛	4⅛— 5⅛	..	..	..	5 0 0
850,000	Do. 4½ % 1st Deb. Stock	100	4½%	4½%	4½%	4½%	97 —100	96 — 99	..	..	..	4 10 0
35,000	Callender's Cable Construction shares	5	15 %	15 %	10 %	..	9⅜— 9⅝	9⅜— 9⅝	9 7/8	9⅜	..	5 0 0
40,000	Do. do. 5 % Cum. Pref.	5	5 %	5 %	5 %	..	4½— 5	4½— 5	..	..	..	4 18 0
800,000	Do. do. 4½ % 1st Mort. Deb. Stock Red.	Stock	4½%	4½%	4½%	4½%	102 —104	102 —104	102⅞	..	..	4 6 7
491,222	Cape E. Trams., 1 to 491,222	1	Nil	Nil	Nil	..	17/32— 9/16	½— ⅝	11/-	10/-	..	Nil
450,000	Castner-Kellner Alkali, 1 to 450,000	1	12 %	12½%	17½%	..	3 7/16— 3 5/8	3 5/16— 3 7/16	64/6	..	..	5 6 1
205,369	Do. do. 4½ % 1st Mort. Deb. Stock	100	4½%	4 %	4½%	4½%	103 —106	103 —106	104⅛	103½	..	4 4 11
1,854,720	Central London Railway, Ord. Stock	Stock	3 %	3½%	3 %	3 %	66 — 68 xd	68 — 70	69⅝	68½	+2	4 5 9
572,640	Do. do. 4 % Pref. Stock	Stock	4 %	4 %	4 %	4 %	83 — 85 xd	84 — 86	85⅝	..	+1	4 13 0
572,640	Do. do. Def. do.	Stock	2 %	2½%	2 %	2 %	47 — 49 xd	49 — 51	50½	50¼	+2	3 18 5
1,480,000	City and South London Railway	Stock	2½%	1½%	1½%	1½%	28 — 29 xd	29 — 30	29⅜	28¼	+1	5 0 0
85,000	Crompton & Co., Nos. 1 to 85,000	8	5 %	Nil	Nil	..	⅛— ¼	⅛— ¼	..	..	..	Nil
100,000‡	Do. 5 % 1st Mort. Reg. Debs., 1 to 900 of £100, and 901 to 1,100 of £50 Red	..	5 %	5 %	5 %	5 %	70 — 80	70 — 80	..	..	..	6 0 5

* Unless otherwise stated, all shares are fully paid. ‡ From Manchester Share List.

Continued on next page.

SHARE LIST OF ELECTRICAL COMPANIES.—(*Continued.*)

ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.—(*Continued.*)

Present Issue.	NAME.	Stock or Share.	Dividends for the last four years. 1907.	1908.	1909.	1910.	Closing Quotations Feb. 14th.	Closing Quotations Feb. 21st.	Business done week ended Feb. 21st, 1911. Highest	Lowest	Rise + or Fall —	Present Yield per cent. £ s. d.
260,000	Dick, Kerr & Co., 1 to 260,000	*	10 %	6 %	5 %	..	1⅝ — 1 1/16	1⅝ — 1 1/16	21/10½	..	..	4 14 1
305,000	Do. do. 6 % Cum. Pref., 1 to 305,000	1	6 %	6 %	6 %	..	1 — 1⅛	1 — 1⅛	21/10½	..	..	5 6 8
265,480	Do. do. 4½ % Deb. Stock	100	4½%	4½%	4½%	4½%	97 —100	97 —100	..	..	..	4 10 0
60,000	Dublin United Trams. (1896), 6 % Pref., 1 to 60,000	10	6 %	6 %	6 %	6 %	12½ — 13½ xd	12½ — 13½	..	..	..	4 10 7
99,261	Edison & Swan Utd., "A" shs., £3 pd., 1 to 99,261	5	2½%	Nil	Nil	..	3/8 — ½	3/8 — 7/16	13/3	8/9	+ 1/16	Nil
17,189	Do. "A" shares, 01—017,189	5	2½%	Nil	Nil	..	1 3/16 — 1 5/16	1½ — 2½	42/6	41/3	+ 3/32	Nil
307,895	Do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	61 — 66	63 — 67	..	..	+ 1	5 19 5
67,720	Do. 5 % 2nd Deb. Stock Prov. Certs. all pd.	100	5 %	5 %	5 %	5 %	77 — 80	78 — 81	..	..	+1	6 3 5
112,100	Electric Construction, 1 to 112,100	2	Nil	Nil	Nil	..	¾ — 1	¾ — 1	..	..	..	Nil
31,390	Do. do. 7 % Cum. Pref., 1 to 31,390	2	7 %	7 %	7 %	..	1 1/16 — 2 3/16	1 1/16 — 2 3/16	..	..	— 1/8	7 0 0
25,000	General Electric Co. (1900), 5 % Cum. Pref.	10	5 %	5 %	5 %	..	8 — ½	8 — 8½	..	..	..	5 17 8
200,000	Do. do. 4 % Mort. Deb.	Stock	4 %	4 %	4 %	4 %	80 — 84	85 — 90	..	..	+5½	4 8 11
78,000	Gt. N. & City Rail. Pref. Ord. "A" 4 %, 1 to 78,000	10	¾%	Nil	Nil	..	¾ — 1	¾ — 1	..	..	..	Nil
96,000	Greenwood & Batley, 7 % Cum. Pref.	10	7 %	7 %	7 %	..	10¼ — 10¾	10¼ — 10¾	..	..	..	6 10 8
80,000	Do. do. 5 % Mort. Debs.	100	5 %	5 %	5 %	5 %	102 —103½	102 —103½	..	..	..	4 16 10
40,000	Henley's (W.T.), Telegraph Works, Ord.	5	15 %	15 %	15 %	..	12½ — 13	12½ — 13	..	..	..	5 15 5
40,000	Do. do. 4½ % Pref.	5	4½%	4½%	4½%	..	5 — 5¼	5 — 5¼	..	..	..	5 4 8
150,000	Do. do. 4½ % Mort. Deb Stock	Stock	4½%	4½%	4½%	4½%	107 —109	107 —109	..	..	..	4 5 9
50,000	India-Rubber, Gutta-percha & Telegraph Works	10	10 %	10 %	10 %	..	15⅝ — 16½	15⅝ — 16½	16⅛	..	+ ⅛	6 1 3
37,500	†Liverpool Overhead Railway, Ord.	10	¾%	Nil	Nil	1½%	1 1/16 — 1 1/8	1 1/16 — 1 1/8	..	..	+ 1/16	8 6 5
10,000	† Do. do. Pref., fully paid	10	5 %	5 %	5 %	5 %	7 — 7½	7 — 7½	..	..	+ ¼	6 13 4
600,070	London United Trams. (1901) 1 to 50,007	10	3 %	Nil	Nil	Nil	1½ — 2½	1½ — 2½	..	..	..	Nil
299,930	Do. do. 60,008 to 100,000	10	3 %	Nil	Nil	Nil	1½ — 2½	1½ — 2½	..	..	..	Nil
125,000	Do. do. 5 % Cum. Pref., 1 to 125,000	10	5 %	3⅜%	Nil	Nil	2⅜ — 2¾	2 — 2¾	..	..	— ⅜	..
1,649,930	Do. do. 4 % 1st Mort. Deb. Stock	100	4 %	4 %	4 %	4 %	70 — 74	71 — 75	72½	72½	+1	5 6 8
5,732,062	Metropolitan Consolidated	100	1%	1%	1 %	1½%	41½ — 42	43½ — 44	44½	41	+2	2 11 0
2,640,914	Do. Surplus Lands	100	2⅜%	2⅜%	2⅜%	2⅜%	63 — 65	63 — 65	64⅛	63⅜	..	4 3 4
8,235,000	Do. District	100	Nil	Nil	Nil	Nil	25⅞ — 26½	26 — 26½	26⅜	26⅛	— ⅛	Nil
391,337	Metropolitan Electric Trams., Ord.	1	..	4½%	5%	..	1 5/16 — 1 7/16	1⅛ — 1 7/16	20/3	20/-	..	4 14 1
314,016	Do. do. Defd.	1	Nil	Nil	Nil	..	3/16 — 3/8	1/16 — ⅜	5/-	4/6	+ 1/32	Nil
500,000	Do. do. 5 % Cum. Pref.	1	5 %	5 %	5 %	..	¾ — 1 xd	¾ — 1	18/6	..	..	5 0 0
589,183	Do. do. 4½ % Deb. Stock Red.	100	4½%	4½%	4½%	..	99½ —101½	100 —102	101½	100½	+ ½	4 8 3
$10,825,200	Mexico Trams Co., Common Stock	..	..	..	6 %	..	129 —130	127⅜ —128⅜	129⅜	128⅜	—1¼	4 13 2
$9,000,000	Do. 1st Mort. 50-year 5 % Gld. Bds.	..	..	5 %	5 %	..	99⅜ —100⅜	99⅜ —100⅜	100⅜	100	..	4 19 3
245,000	Potteries Electric Traction	1	4 %	Nil	2 %	..	1/16 — 1/8	1/16 — 1/8	..	..	..	6 8 0
245,000	Do. 5 % Cum. Pref.	1	5 %	5 %	5 %	..	⅛ — ¼ xd	⅛ — ¼	11/9	11/6	..	7 5 5
245,000	Do. 4½ % Deb. Stock	100	4½%	4½%	4½%	4½%	80 — 83	80 — 83	80½	..	..	5 8 5
37,350	Telegraph Construction and Maintenance	12	17½%	15 %	17½%	20 %	39 — 41	39 — 41	..	..	..	5 17 8
140,000	Do. 4 % Deb. Bds., 1 to 1,500 Red., 1919	100	4 %	4 %	4 %	4 %	100 —102	100 —102	..	..	..	3 18 5
1,000,000	Underground Electric Railway, 5 % Prior Lien	..	..	5 %	5 %	..	102⅛ —103⅛	102⅛ —103⅛	103⅜	102¼	..	4 16 7
2,818,700	Do. do. 4½ % Bonds	..	..	4½%	4½%	..	95 — 97	95 — 97	96⅛	95⅛	..	4 12 9
4,928,050	Do. do. 6 % Income Bonds	..	..	..	..	1 %	43 — 45	44 — 46	45¾	44	+ 1	2 3 6
66,666	Willans & Robinson, 1 to 80,000 & 80,001 to 116,666	1	10 %	5 %	Nil	..	⅛ — ¼	⅛ — ¼	..	..	..	..
66,666	Do. 6 % C.P., 80,001 to 80,000 & 125,001 to 141,666	5	6 %	6 %	3 %	..	1 — 1½	1 — 1½	..	..	..	10 0 0
215,769	Do. 4 % 1st Mort. Deb. Stock	100	4 %	4 %	4 %	4 %	55 — 65	55 — 65	..	..	..	6 3 1

ELECTRICITY SUPPLY COMPANIES.

80,449	Brompton & Kens. Elec. Lt. Sup., Ord., 1 to 80,449	5	10 %	10 %	10 %	..	7¼ — 7⅜	7¼ — 7⅜	..	..	..	6 9 0
9,551	Do. do. 7 % Cum. Pref.	5	7 %	7 %	7 %	..	7¼ — 7⅜	7¼ — 7⅜	101½	100	..	4 10 4
402,000	Central Electric Supply 4 % Guar. Deb. Stock	100	4 %	4 %	4 %	4 %	99 —103	99 —103	88/9	86/10½	..	3 17 8
80,000	Charing Cross and Strand Electricity Supply	5	5 %	5 %	5 %	..	3⅝ — 4⅜	4 — 4½	..	..	+ ⅛	5 11 1
80,000	Do. do. 4½ % Cum. Pref.	5	4½%	4½%	4½%	..	4⅛ — 4⅜ xd	4⅛ — 4⅝	82/6	80/-	..	4 17 4
80,000	Do. "City Undertaking" 4½ % Cum. Prf.	5	4½%	4½%	4½%	..	3⅝ — 4⅛	3¾ — 4¼	..	..	+ ⅛	5 5 11
445,736	Do. do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	95 — 97	95 — 97	..	..	..	4 2 6
49,436	Chelsea Electricity Supply, Ord.	5	4½%	4½%	4½%	5 %	4⅛ — 4⅜	4⅛ — 4⅝	87/6	86/3	..	5 8 1
175,000	Do. do. 4½ % Deb. Stock Red.	Stock	4½%	4½%	4½%	4½%	98 —100	99 —101	..	..	+1	4 9 1
70,596	City of London Elec. Lighting, Ord. 40,001—110,595	10	6 %	6 %	7 %	7 %	11⅝ — 12⅜	11⅜ — 12¼	12½	11⅛	— ⅛	5 14 3
40,000	Do. 6 % Cum. Pref., 1 to 40,000	10	6 %	6 %	6 %	6 %	12 — 13	12 — 13	..	..	..	4 12 4
400,000	Do. 5 % Db. Stk.	Stock	5 %	5 %	5 %	5 %	118 —122	119 —123	120½	120	+1	4 1 4
800,000	Do. 4½ % 2nd. Db. Stk.	100	4½%	4½%	4½%	4½%	99 —102	99 —102	..	..	..	4 8 3
50,000	County of Durham Electrical Power, Ord.	5	2 %	Nil	Nil	..	1⅜ — 2	1⅜ — 2	..	..	..	Nil
50,000	Do. do. do. 5 % Pref.	5	5 %	5 %	5 %	..	2⅜ — 3⅛	2⅜ — 3⅛	..	..	..	7 16 10
250,000	Do. do. do. 5 % 1st Mtg. Deb.	Stock	..	5 %	5 %	5 %	92 — 94	92 — 94	..	..	..	5 6 5
40,000	County of London Electric Lighting, Ord. 1—40,000	10	5 %	5 %	5 %	..	7⅞ — 8¼	7⅞ — 8¼	8⅜	8	..	6 1 3
55,000	Do. do. 6 % Pref., 40,001—80,000 and 120,001—135,000	10	6 %	6 %	6 %	..	10⅜ — 11½	10⅜ — 11½	11 1/16	10 15/16	+ ⅛	5 6 8
450,000	Do. do. 4½ % Deb. Stock	Stock	4½%	4½%	4½%	4½%	105 —108	105 —108	107	106½	..	4 8 4
450,000	Do. do. 4½ % 2nd. Deb. Stock	Stock	4½%	4½%	4½%	4½%	98 —101	98 —101	100½	..	..	4 9 1
80,000	Edmundson's Electric Corporation, Ord. Shares	5	Nil	Nil	Nil	..	1/16 — ⅛	1/16 — ⅛	..	..	..	Nil
80,000	Do. do. 6 % Cum. Pref.	5	Nil	Nil	Nil	..	1½ — 2	1⅝ — 2⅛	35/-	..	+ ⅛	Nil
480,500	Do. do. 4½ % 1st Mort. Deb. Stk.	100	4½%	4½%	4½%	4½%	78 — 81	79 — 82	..	..	+1	5 9 9
$8,150,000	Electrical Dev. Co. of Ontario, 5% 1st Mtg. Gold Bnds.	$500	..	5 %	5 %	..	83 — 85	83⅛ — 85½	..	..	+ ⅛	5 17 0
10,000	Folkestone, 1 to 10,000	5	5%	5%	5%	..	4⅛ — 4⅜	4⅛ — 4⅜	..	..	..	5 12 10
10,000	Do. 5 % Cum. Pref., 1 to 10,000	5	5 %	5 %	5 %	..	4⅛ — 5⅜	4⅛ — 5⅜	..	..	..	4 11 11
94,350	Do. 4½ % 1st Deb. Stock	100	4½%	4½%	4½%	4½%	97 —100	97 —100	..	..	..	4 10 0
15,000	Hove, 1 to 15,000	5	8½%	8½%	8½%	..	6⅜ — 7⅛	6⅜ — 7⅛	..	..	..	5 19 4
$1,526,500	Kaministiquia Power Co., 5 % Gold Bnds.	100	..	5 %	5 %	..	101 —103	101 —103	102½	..	..	4 17 1
21,000	Kensington and Knightsbridge Electric Ord.	5	10 %	8 %	8 %	9 %	6½ — 6⅞	6⅞ — 7¼	..	..	+ ⅛	5 10 4
90,000	Do. do. do. 4 % Deben. Stk.	Stock	4 %	4 %	4 %	4 %	93 — 95	93 — 95	..	..	..	4 4 3
111,000	London Electric Supply Corporation, Limited, Ord.	3	2½%	3 %	2 %	2 %	1⅝ — 2	1⅝ — 2	..	..	..	3 0 4
90,000	Do. do. do. 6 % Pref.	5	6 %	6 %	6 %	6 %	4⅛ — 5⅛	4⅛ — 5⅛	..	..	..	5 14 3
867,355	Do. do. 4 % 1st Mort. Deb. Stk. Red.	Stock	4½%	4 %	4 %	4 %	90 — 93	90 — 93	91⅝	..	..	4 6 0
200,000	Metropolitan Electric Supply, 100,001 to 300,000	5	6½%	5 %	5 %	..	4⅜ — 4⅝	4⅜ — 4⅝	92/6	87/6	— ⅛	5 5 3
76,121	Do. 4½ % Cum. Pref. 1—76,121	5	4½%	4½%	4½%	..	4⅛ — 4⅜	4⅛ — 4⅜	..	..	..	5 0 0
250,000	Do. 4½ % 1st Mort. Deben. Stock	Stock	4½%	4½%	4½%	4½%	100 —103	101 —104	..	..	+1	4 6 7
248,000	Do. 3½ % Mort. Deben. Stock Redem.	Stock	3½%	3½%	3½%	3½%	83 — 86	83 — 86	..	..	..	4 1 5
$5,929,600	Mexican Electric Light Co., 5% 1st Mtg. Gold Bnds	100	5 %	5 %	5 %	5 %	89½ — 90½	90½ — 91½	91½	90	+1	5 9 3
$13,585,000	Do. Light and Power Co., Ltd., Common	$100	4 %	3½%	4 %	..	93½ — 94½	93 — 94	94½	93	— ½	4 5 1
$5,400,000	Do. do. 7% Cum. Pref. Stk.	Stock	..	7 %	7 %	..	112½ —113½	112½ —113½	113⅜	112½	..	6 3 4
$12,000,000	Do. do. 5% 1st Mtg. Gold Bnds.	100	..	5 %	5 %	5 %	95 — 96	95⅜ — 96½	96½	95½	+ ⅛	5 3 8
250,000	Midland Electric Corporation, 4½ % 1st Mort. Deb.	100	4½%	4½%	4½%	4½%	96 — 98	96 — 98	..	..	..	4 11 10
180,491	Newcastle-on-Tyne, 1 to 50,000 & 57,010 to 137,500	5	8 %	2½%	4 %	..	3⅜ — 4⅛	3⅜ — 4⅛	..	..	..	2 12 9
137,500	Do. 5% Pref., 1 to 137,500 Non.Cum.	5	5 %	5 %	5 %	..	4⅛ — 4⅜	4⅛ — 5⅛	..	..	+ ⅛	4 17 7
150,000	North Metropolitan Electric Power Supply Co., 5 % Mortgages (Red.), Nos. 1 to 1,500	100	..	..	5 %	..	97½ — 99½	97⅛ — 99½	..	..	..	5 0 6
10,852	Notting Hill Electric Lighting	10	7½%	7 %	7½%	..	11⅛ — 12½	11⅛ — 12½	..	..	..	5 12 0
20,000	Oxford, 1 to 96 and 407 to 20,310	5	7 %	7 %	7 %	..	6⅛ — 6⅜	6⅛ — 6⅜	..	..	..	5 3 8
120,000	River Plate Elcty. Co. Ord.	Stock	6 %	8 %	9 %	..	228 —238	225 —235	230½	226	—3	3 16 6
100,000	Do. do. 6% Non Cum. Pref.	Stock	6 %	6 %	6 %	..	103 —113	103 —113	..	..	..	5 6 2
200,000	Do. do. 5% Deb. Stk. Red.	100	5 %	5 %	5 %	5 %	102 —104	102 —104	..	..	..	4 16 3
40,000	St. James' and Pall Mall Electric Light, Ord.	5	10 %	10 %	10 %	10%	8⅛ — 9	8⅛ — 9	8⅜	..	..	5 11 1
20,000	Do. do. 7 % Pref. 20,081 to 40,080	5	7 %	7 %	7 %	7 %	6⅝ — 7⅜	6⅝ — 7⅜	..	..	..	4 0 6
150,000	Do. do. 3½ % Deb. Stock Red.	100	3½%	3½%	3½%	3½%	86 — 88	86 — 88	..	..	..	3 19 7
12,000	Smithfield Markets Electric Supply, Ord.	5	Nil	Nil	Nil	Nil	1⅛ — 2	1⅛ — 2	..	..	..	Nil
65,000	South London Electric Supply, Ord.	4	4 %	5 %	5 %	5 %	3 — 3⅜	3 — 3⅜	65/-	..	..	5 19 5
100,000	Do. do. 5 % 1st Mort. Deb.	100	..	5 %	5 %	5 %	101 —104	101 —104	102	..	..	4 16 3
120,000	South Met. Elec. Lt. & Power, Ord.	1	2½%	2½%	Nil	Nil	3/16 — ¼	3/16 — ¼	..	..	..	Nil
142,968	Do. do. 7 % Pref.	1	7 %	7 %	7 %	7 %	1 3/16 — 1 5/16	1 3/16 — 1 7/16	..	..	+ 1/32	6 11 9
240,000	Do. do. 4½ % 1st Deb. Stk.	100	4½%	4½%	4½%	4½%	97 — 99	97 — 99	97½	..	..	4 10 11
80,000	Urban Electric Supply, Ord.	5	5 %	5 %	5 %	..	3/16 — ¼	⅜ — ¼	..	..	..	20 0 0
50,000	Do. do. 5 % Cum. Pref.	5	5 %	5 %	5 %	..	1⅞ — 2¼	1⅞ — 2¼	..	..	..	11 2 0
271,700	Do. do. 4½ % 1st Mort. Db. Stk. Red.	100	4½%	4½%	4½%	4½%	80 — 84	80 — 84	..	..	..	5 7 2
808,000	Victoria Falls Power Co., Pref. Nos. 1 to 808,000	1	..	5 %	6½%	10 %	13/16 — 7/8	13/16 — 15/16	..	..	+ 1/32	5 5 8
110,000	Westminster Electric Supply, Ord.	5	10 %	10 %	10 %	10%	8⅛ — 8⅜	8⅛ — 8⅜	8 9/32	..	..	5 15 11
81,270	Do. do. 4½ % Cum. Pref. (Reduced from 5% since 31st Dec., 1905)	5	4½%	4½%	4½%	4½%	5 — 5⅛	5 — 5⅛	..	..	..	4 3 9

* Unless otherwise stated, all shares are fully paid. † Quotations on Liverpool Stock Exchange.

Bank rate of Discount 3½ per cent. February 16th, 1911.

ELECTRICITY IN MINES.

(Continued from page 257.)

Small motors supplied by low-pressure current through such switch-transformers are cheaper and more reliable than motors supplied direct by high or medium-pressure current. In the case of coal-cutter motors, the severe conditions of working make the advantages of transforming to low pressures for use even more pronounced than in the case of fixed motors.

A system using high or extra-high pressure for transmission, high or medium pressures for large motors, and low pressures for small motors and lighting, may thus be obtained, and is safer, more reliable, and probably cheaper to install, than a system using medium pressure throughout.

The introduction of high-pressure transmission has led to a recognition of the importance of better mechanical construction for all electrical apparatus. The three-phase induction motor of the squirrel-cage type is best suited to mining conditions because of the absence of rubbing contacts carrying current, and because the rotating part of such a motor readily lends itself to good mechanical construction. Marble or slate switchboards are being superseded by switchgear completely enclosed in strong metal cases.

Accidents due to mechanical failure of parts of apparatus (and most of them are due to this cause) should not be laid at the door of electricity, but rather at that of the system which allows defective apparatus, in some cases obviously ill-designed for its purpose, to be used. Colliery managers should interest themselves in the mechanical construction of electrical apparatus, and not leave too much to contractors.

Several instances of underground fire due to the lack of fireproof construction of motor rooms, &c., have occurred, and in the revised rules it is therefore provided that uninflammable material only shall be used in the construction of every place containing apparatus, unless the apparatus itself is so constructed, protected, and worked as to remove the risk of fire.

The Committee regards a sound connection to earth for all metallic coverings and casings, whether the apparatus be fixed or portable, as the best safeguard against shock that exists in underground conditions. The exemption of portable machinery (including trailing cables) is to be withdrawn altogether ; and earthing is required where the alternating pressure in a system exceeds 125 volts. The amendments make the revised rules considerably more stringent than the existing rules.

The only effective method of obtaining a good earth is to rely, primarily at any rate, upon a surface earthing system placed in carefully chosen surroundings. Local earth plates underground are now regarded as not sufficiently reliable for their purpose.

A system designed for high pressure can be made as safe in operation as regards risk of shock and risk of explosion as one designed for medium or low pressure, and the Committee is definitely of opinion that where it is safe to use electricity at all there is no reason, except in the case of portable machinery, small motors, and lighting, for applying any limit of pressure.

In Rule 10 of the revised code, relating to switchgear and all terminals, cable joints, and connections, an attempt has been made to set out the general principles to be complied with by such apparatus, as the Committee feels that too little regard has been paid to these general principles in the past.

The Committee considers that all cables should preferably be multi-core, or in the case of a two-wire system, two-core or concentric ; and that all two-core or multi-core cables (except trailing cables) should be provided with an efficient metallic covering. In a dry pit insulated single-core cables without a metallic covering may make a satisfactory job, but above low pressure, and especially where there is danger of mechanical damage, the system is not to be recommended. In those cases in which armoured cables have proved to be unsatisfactory, the Committee considers this to have been mainly due to the use of armouring which has been either too light or insufficiently protected from the action of corrosive pit-water.

In order to avoid danger every faulty cable must be made dead as soon as possible, the metallic covering must be of sufficient electrical conductivity to deal with the leakage current in case of a fault, and where on account of the risk of explosion of gas or coal-dust open sparking is to be avoided, the cable must be so constructed as to confine any arc which may arise to the inside of the metallic covering. The Committee is satisfied that cables provided with an efficient metallic covering coupled with proper means to open the circuit in case of a fault, best fulfil these conditions.

Given well-constructed apparatus properly maintained, preservation of the continuity of cable armouring is merely a matter of reasonable care in supervision.

As regards shot firing, permission to use power and lighting cables in sinking pits is withdrawn, and, as regards signalling, permission to use bare signalling wires in haulage roads where gas may occur is also withdrawn.

The general exemption on the ground of emergency or special circumstances which forms existing Rule 56, will be retained. Exemptions from the provisions of Sub-Secs. (*c*), (*d*) and (*e*) of Rule 12 should be granted in favour of existing medium and low pressure apparatus, but only if the conditions in the mine are favourable, and if the standard of maintenance which applies is such as to reduce the risk of danger arising to the minimum.

Conclusion.—Apart from the more concise arrangement and wording of the revised rules, it will be seen that the main directions in which the requirements to be met have been strengthened, are the following :—

(i) By prohibiting the use of electricity where on account of the risk of explosion such use would be dangerous

(ii) By providing that inflammable material shall not be used in the construction of motor rooms where there exists the risk of fire.

(iii) By more stringent regulations as regards the earthing of the outer coverings of apparatus.

(iv) By clearly setting forth the conditions to be fulfilled by switchgear.

(v) By insisting upon the better mechanical construction of cables and apparatus.

(vi) By providing for the proper supervision of apparatus.

Generally the intention has been to call for improved construction and better maintenance. The Committee has endeavoured to set out clearly the conditions to be fulfilled, leaving it to the engineer and to the manufacturer to determine the exact way in which to meet those conditions by proper construction. It is hoped that in this way a higher standard will be attained without interfering with commercial requirements or the natural development of apparatus.

APPENDIX A.

Special Rules for the Installation and Use of Electricity in Mines.

Duties.—It shall be the duty of the mine-owner, agent, and manager to comply with and enforce the rules. And it shall be the duty of all workmen and persons employed to conduct their work in accordance with the rules.

1. *The Use of Electricity Prohibited in Certain Places.*—The use of electricity is prohibited in any part of a mine where, on account of the risk of explosion of gas or coal dust, such use would be dangerous to life.

In case any difference of opinion shall arise between an Inspector of Mines and an owner under this rule, the same shall be settled as provided in Sec. 42 of the Coal Mines Regulation Act.

2. *Notices for H.M. Inspector.*—Notices shall be sent to H.M. District Inspector of Mines, on the forms prescribed by the Secretary of State, as follows, namely :—

(i) Notice of any existing apparatus. To be sent within one month from the date on which these rules come into force at the mine.

(ii) Notice of the intention to introduce or add to or re-erect apparatus in any mine.

(iii) Notice of the intention to introduce or reintroduce electricity into any mine where the use of electricity has previously been prohibited under Rule 1.

(iv) An annual return giving the size and type of apparatus, and any particulars which may be required as to the circumstances of its use. To be sent on or before January 21st in every year.

If H.M. District Inspector of Mines does not object in writing, within one calendar month from the receipt by him of the notice, to the carrying out of either of the intentions specified in the second or third notices, the owner shall be entitled to carry out such intention or intentions.

3. *Plan.*—A proper plan on the same scale as that kept at the mine in fulfilment of the requirements of the Coal Mines Regulation Act shall be kept in the office at the mine, showing the position and size of all fixed apparatus in the mine. The said plan shall be corrected as often as may be necessary to keep it reasonably up to date, and it shall be produced to any Inspector of Mines at any time on his request.

4. *Notices for Workmen.*—The following notices, suitably constructed of durable material, shall be exhibited where required :—

(i) A notice prohibiting any person other than an authorised person from handling or interfering with apparatus.

(ii) A notice containing directions as to procedure in case of fire. This notice shall be exhibited in every place containing apparatus.

(iii) A notice containing directions as to the restoration of persons suffering from the effects of electric shock.

(iv) A notice containing instructions how to communicate with the person appointed under Rule 11 (*a*). This notice shall be exhibited at the shaft bottom.

5. *Lighting, Telephones and Fire Buckets.*—(*a*) In all places lighted by electricity where a failure of the electric light would be likely to cause danger, one or more safety lamps or other proper lights shall be kept continuously burning.

(*b*) Efficient telephonic or other equivalent means of communication shall be provided for communicating between the place in which the switchgear provided under Rule 11 (*a*) is erected and the shaft bottom or main distributing centre in the pit.

(*c*) Fire buckets of suitable capacity, filled with clean dry sand ready for immediate use in extinguishing fires, shall be kept in every place containing apparatus.

6. *Housing of Apparatus and Working Space.*—(*a*) Where necessary to prevent danger or mechanical damage transformers and switchgear shall be be placed in a separate room, compartment or box.

(*b*) Unless the apparatus is so constructed, protected and worked as to obviate the risk of fire, no inflammable material shall be used in the construction of any room, compartment or box containing apparatus, or in the construction of any of the fittings therein. Each such room, compartment or box shall be substantially constructed and shall be kept dry.

(*c*) Adequate working space and means of access clear of obstruction and free from danger, shall be provided for all apparatus that has to be worked or attended to by any person, and all handles intended to be operated shall be conveniently placed for that purpose.

7. *The Construction of Apparatus and the Insulation of a System.*—(*a*) All apparatus and conductors shall be sufficient in size and power for the work they may be called upon to do, and so constructed, installed, protected, worked and maintained, as to prevent danger so far as is reasonably practicable.

(*b*) All insulating material shall be chosen with special regard to the circumstances of its proposed use. It shall be of mechanical strength sufficient for its purpose, and, so far as is practicable, it shall be of such a character or so protected as fully to maintain its insulating properties under working conditions of temperature and moisture.

(*c*) Every part of a system shall be kept efficiently insulated from earth, except that (i) the neutral point of a polyphase system may be earthed at one point only; (ii) the mid-voltage point of any other system may be earthed at one point only; and (iii) the outer conductor of a two-wire concentric system shall be earthed. Where any point of a system is earthed it shall be earthed by connection to an earthing system at the surface of the mine.

(*d*) Efficient means shall be provided for immediately indicating any defect in the insulation of a system.

8. *Earthing.*—(*a*) All metallic sheaths, coverings, handles, joint-boxes, switchgear frames, instrument covers, switch and fuse covers and boxes, and all lampholders, unless efficiently protected by an earthed or insulating covering made of fire-resisting material, and the frames and bedplates of generators, transformers and motors (including portable motors), shall be earthed by connection to an earthing system at the surface of the mine.

(*b*) Where the cables are provided with a metallic covering constructed and installed in accordance with Rule 12 (*e*), such metallic covering may be used as a means of connection to the earthing system. All earth conductors other than the said metallic covering shall have a conductivity at all parts and at all joints at least equal to that of the largest conductor supplying the apparatus a part of which it is desired to earth.

(*c*) All joints in earth conductors and all joints to the metallic covering of the cables shall be properly soldered or otherwise efficiently made, and every earth conductor shall be soldered into a lug for each of its terminal connections. No switch, fuse, or circuit-breaker shall be placed in any earth conductor.

This rule shall not apply (except in the case of portable apparatus) to any system in which the pressure does not exceed low pressure direct current or 125 volts alternating current.

9. *Use of High or Extra-high Pressure Current.*—(*a*) Where electricity is distributed at a pressure higher than medium pressure (i) it shall not be used without transformation to medium or low pressure except in fixed machines in which the high or extra-high pressure parts are stationary; and (ii) motors under 20 H.P. shall be supplied with current through a transformer stepping down to medium or low pressure.

(*b*) Where energy is transformed, suitable provision shall be made to guard against danger by reason of the lower pressure apparatus becoming accidentally charged above its normal pressure by leakage from or contact with the higher pressure apparatus.

10. *Switchgear, &c.*—Switchgear and all terminals, cable ends, cable joints, and connections of apparatus, shall be constructed and installed so that—

(i) All parts shall be of mechanical strength sufficient to resist rough usage.

(ii) All conductors and contact areas shall be of ample current carrying capacity and all joints in conductors shall be properly soldered or otherwise efficiently made.

(iii) The lodgment of any matter likely to diminish the insulation and of coal-dust on or close to live parts shall be prevented.

(iv) All live parts shall be so protected or enclosed as to prevent accidental contact by persons, and danger from arcs or short circuits, fire or water.

(v) Where there may be risk of igniting gas, coal-dust, or other inflammable material, all parts shall be so protected as to prevent open sparking.

11. *Control of the Supply of Current.*—(*a*) Properly constructed switchgear for cutting off the supply of current to the mine shall be provided at the surface of the mine within 200 yards measured by road or path from the pit shaft or drift containing the cables, and during the time any cable is live a person authorised to operate the said switchgear shall be available within easy reach thereof.

Lightning arresters, properly adjusted and maintained, shall be provided where necessary to prevent danger.

(*b*) Efficient means, suitably placed, shall be provided for cutting off all pressure from every part of a system, as may be necessary to prevent danger.

(*c*) Efficient means shall be provided for cutting off all pressure automatically from the part or parts of the system affected in the event of a fault or leakage of current.

(*d*) Every motor shall be controlled by efficient switchgear for starting and stopping, so arranged as to cut off all pressure from the motor and from all apparatus in connection therewith, and so placed as to be easily worked by the person appointed to work the motor.

(*e*) If the concentric system is used, no switch, fuse, or circuit-breaker shall be placed in the outer conductor, or in any conductor connected thereto. Nevertheless, switches, fuses, or circuit-breakers may be used to break the connection with the generators or transformers supplying the electricity; provided that in a concentric system the connection of the outer conductor with the earthing system shall not thereby be broken.

12. *Cables (other than Flexible Cables for Portable Apparatus and Signalling Wires).*—(*a*) All cables shall be covered with insulating material (except that the return conductor of a concentric system may be bare). The lead sheath of lead-sheathed cables and the iron or steel armouring of armoured cables shall be of not less thickness respectively than is recommended by the Engineering Standards Committee.

(*b*) All cables shall be efficiently protected from mechanical damage and supported at sufficiently frequent intervals, and in such a manner as adequately to prevent danger and damage to the cables.

(*c*) Concentric cables, or two-core or multi-core cables protected by a metallic covering, shall in all cases be used (i) where the pressure exceeds low pressure; (ii) where the roadway conveying the cables is also used for mechanical haulage; and (iii) where there may be risk of igniting gas, coal-dust, or other inflammable material.

(*d*) Single-core cables shall either be enclosed in a metallic covering, which shall contain all the conductors of the circuit, or they shall be properly secured by some non-conducting and readily breakable material to efficient insulators.

(*e*) The metallic covering of every cable shall be (i) electrically continuous throughout; (ii) earthed at the surface of the mine by a connection to the earthing system of not less conductivity than the same length of the said metallic covering; (iii) efficiently protected against corrosion where necessary; (iv) of a conductivity at all parts and at all joints at least equal to 50 per cent. of the conductivity of the largest conductor enclosed by the said metallic covering; and (v) where there may be risk of igniting gas, coal-dust, or other inflammable material, so constructed as to prevent as far as is practicable any fault or leakage of current from the live conductors from causing open sparking.

(*f*) All cables and conductors where joined up to motors, transformers, switchgear, and other apparatus, shall be installed so that (i) they are mechanically protected by securely attaching the metallic covering (if any) to the apparatus; and (ii) the insulating material at each cable end is efficiently sealed so as to prevent the diminution of its insulating properties. Where necessary to prevent abrasion or to secure gas tightness, there shall be properly constructed bushes.

13. *Portable Apparatus.*—(*a*) Flexible cables for portable apparatus shall be two-core or multi-core and covered with insulating material which shall be efficiently protected from mechanical damage. If a flexible metallic covering be used as a means of protection from mechanical damage the same shall not alone be used to form an earth conductor for the portable apparatus.

(*b*) Every flexible cable for portable apparatus shall be connected to the system and to the portable apparatus itself by a properly constructed connector.

(*c*) At every point where flexible cables are joined to main cables a switch capable of entirely cutting off the pressure from the flexible cables shall be provided.

(*d*) No lampholder shall be in metallic connection with the guard or other metal work of a portable lamp.

14. *Supervision and Working of Apparatus.*—(*a*) Every person appointed to work, supervise, examine, or adjust any apparatus, shall be competent for the work that he is set to do. No person except an authorised person or a competent person acting under his immediate supervision shall undertake any work where technical knowledge or experience is required in order adequately to avoid danger.

(*b*) Within one calendar month from the date on which these rules come into force at any mine a person shall be appointed in writing by the manager to supervise the apparatus. The person so appointed, hereinafter called "the electrician," shall be over 21 years of age. If necessary for the proper fulfilment of the duties detailed in the succeeding sub-sections of this rule, the manager shall also appoint in writing an assistant or assistants to the electrician.

(*c*) The electrician shall be in daily attendance at the mine. He shall be responsible for the fulfilment of the following duties, which shall be carried out by him or by an assistant or assistants duly appointed under Sub-Sec. (*b*): (i) the thorough examination of all apparatus (including the testing of earth conductors and metallic coverings for continuity) as often as may be necessary to prevent danger; and (ii) the examination and testing of all new apparatus, and of all apparatus removed from one position in the mine to another before it is put into service in the new position.

Provided that in the absence of the electrician for more than one day the manager shall appoint in writing an efficient substitute.

(*d*) The electrician shall keep at the mine a log-book made up of daily log-sheets kept in the form prescribed by the Secretary of State. The said log-book shall be produced at any time to an Inspector of Mines on his request.

(*e*) Should there be a fault or leakage of current in any circuit, the part affected shall be made dead without delay, and shall remain so until the fault has been remedied.

(*f*) All apparatus shall be kept clear of obstruction and free from dust, dirt and moisture, as may be necessary to prevent danger.

Inflammable or explosive material shall not be stored in any room, compartment or box containing apparatus, or in the vicinity of apparatus.

(*g*) Adequate precautions shall be taken by earthing or other suitable means to discharge electrically any conductor or apparatus, or any adjacent apparatus, if there is danger therefrom, before it is handled, and to prevent any conductor or apparatus from being accidentally or inadvertently electrically charged when persons are working thereon. While lamps are being changed the pressure shall be cut off.

Provided that this rule shall not apply to the cleaning of commutators and slip-rings working at low or medium pressures.

(*h*) The person authorised to work an electrically driven coal-

cutter or other portable machine shall not leave the machine while it is working, and shall, before leaving the working place, ensure that the pressure is cut off from the flexible trailing cable which supplies such coal cutter or other portable machine. Trailing cables shall not be dragged along by the machine when working.

(*i*) Every flexible cable shall be examined periodically (if used with a portable machine, at least once in each shift by the person authorised to work the machine), and if found damaged or defective it shall forthwith be replaced by a spare cable in good and substantial repair kept underground for such purpose. Such damaged or defective cable shall not be further used underground until after it has been sent to the surface and there properly repaired.

15. *The use of Electricity where Inflammable Gas may be present.*—In any part of a mine in which inflammable gas, although not normally present, may occur in quantity sufficient to be indicative of danger, the following additional rules shall be observed :—

(i) All cables, apparatus, signalling wires and signalling instruments shall be constructed, protected and worked, so that in the normal working thereof there shall be no risk of open sparking.

(ii) All motors shall be constructed so that when any part is live all rubbing contacts (commutators and slip-rings) are so arranged or enclosed as to prevent open sparking.

(iii) The pressure shall be switched off apparatus forthwith if open sparking occurs, and during the whole time that examination or adjustment disclosing parts liable to open sparking is being made. The pressure shall not be switched on again until the apparatus has been examined by the electrician or one of his duly appointed assistants and the defect (if any) has been remedied or the adjustment made.

(iv) Every electric lamp shall be enclosed in an airtight fitting, and the lamp globe itself shall be hermetically sealed.

(v) A safety lamp shall be provided and used with each motor when working, and should any indication of fire damp appear from such safety lamp, the person appointed to work the motor shall forthwith cut off the pressure therefrom and report the matter to a deputy or over-man or other official.

16. *Shot Firing.*—(*a*) Current from lighting or power circuits shall not be used for firing shots.

(*b*) Shot-firing cables shall be covered and protected as provided by Rule 13 (*a*) for flexible cables. Adequate precautions shall be taken to prevent them from touching other cables and apparatus.

17. *Signalling.*—(*a*) Where electricity is used for signalling, the pressure in any one circuit shall not exceed 25 volts.

(*b*) Contact-makers shall be so constructed as to prevent the accidental closing of the circuit.

(*c*) Adequate precautions shall be taken to prevent signal and telephone wires from touching cables and apparatus.

18. *Electric Relighting of Safety Lamps.*—(*a*) All relighting apparatus shall be so constructed, worked and maintained as to preclude the generation or accumulation of explosive gas within it.

(*b*) Relighting apparatus shall not be used in any part of a mine to which Rule 15 applies.

(*c*) Where relighting apparatus is used, a suitable station or stations shall be chosen, and relighting apparatus shall not be used in any other place in the mine.

(*d*) Each relighting station shall be in charge of an authorised person, and no person other than the said authorised person shall use the relighting apparatus.

(*e*) All safety lamps shall be examined by the authorised person appointed under Sub-Sec. (*d*) hereof before being relighted, and again examined before being issued.

19. *Locomotives.*—(*a*) Haulage by electric locomotives on the overhead trolley wire system is prohibited in any part of a coal mine.

(*b*) Haulage by electric locomotives on the overhead trolley wire system may be used in mines other than coal mines, and haulage by storage battery locomotives may be used in any mine, with the consent in writing first obtained of the Secretary of State in all cases, and subject to such conditions affecting safety as may be prescribed by him.

20. *Exemptions.*—(*a*) Any of the foregoing requirements shall not apply in any case in which exemption is obtained from the Secretary of State on the ground either of emergency or special circumstances, on such conditions as the Secretary of State may prescribe.

(*b*) Exemption may be claimed from strict compliance with the provisions of Sub-Sec. (*c*), (*d*) and (*e*) of Rule 12 in respect of cables working at or below medium pressure on the date on which these rules come into force at the mine if it can be shown to the satisfaction of H.M. District Inspector of Mines that there is no risk of igniting gas, coal-dust, or other inflammable material, and that the apparatus otherwise complies with the rules.

Where exemption is claimed under this sub-section notice shall be sent to H.M. District Inspector of Mines within one calendar month from the date on which these rules come into force at the mine.

(*To be continued.*)

Fatality.—An engineer's labourer, named James Livingstone, residing in Lothian Street, Bonnyrigg, employed by the Lothian Coal Co., was found lying dead against a wire. It is stated that he had been trying to connect a wire to a "live" wire without orders from the management, and received a fatal shock.

PROCEEDINGS OF INSTITUTIONS.

The Prevention of Accidents.

In a paper by Mr. John Calder, published in the *Proceedings* of the American Society of Mechanical Engineers, the author discusses the causes and means of prevention of accidents in American works. In analysing many thousands of industrial accidents, with a view to devising remedies, the author has found the following to be the chief causes: ignorance, carelessness, unsuitable clothing, insufficient lighting, dirty and obstructed workplaces, defects of machinery and structures, and absence of safeguards.

Insufficient lighting is a cause of numerous accidents, particularly serious and fatal falls. The author has observed that a maximum of accidents occurs towards the close and beginning of each year, that is, during November, December and January, the months of minimum daylight. He bases this statement upon the seasonal distribution for three successive years of about 700 deaths annually from industrial accidents, which were reported with other injuries from an area embracing 80,000 plants of varying extents.

The influence of the duration and intensity of natural light in working hours on fatal and serious accidents is particularly noticeable in founding, bridgebuilding, shipbuilding, engineering, and steel and iron works and other operations such as have to be carried on within large spaces, often entirely in the open air and not easily illuminated artificially to the exclusion of deep shadows.

Within plant buildings the intensity of artificial lighting at the cutting point of tools, for instance, and on very limited machine-tool or bench areas is frequently far above actual requirements and a source of much physical discomfort, while all around the operative a semi-darkness prevails which has a blinding effect in the sudden transitions of the vision required by his employment.

It has been found by exact photometric observations of shop-lighting conditions both during the day and at night, that the concentrated illumination by means of shades of ordinary 16-c.p. incandescent units on cutting tools in machines and the area near them is often several times the intensity of ordinary daylight on the same parts. It is very difficult to convince the operative that he is suffering from too much light at any place and the call is constantly for more light.

What is wanted from the safety point of view and also, the author believes, from considerations of power economy, is the elimination, by good illuminating engineering, of this excessive hard light on spots only, which causes eye-strain and poor vision in surrounding areas with resulting accident. A more generally diffused light of less unit intensity is now easily obtained by the use of fewer but larger screened units experimentally located to suit varying shop requirements and reflecting from whitened wall and ceiling surfaces. The mechanical engineer administering industries or designing plants can do much to reduce the accident risk from this cause.

Dirty and obstructed work-places are closely allied to defective illumination as a source of accident. The literal "shedding of light" on waste and rubbish is often the sure forerunner of their removal and avoidance of accidents due to them. Work-places often retain unnecessarily dirty and obstructed environments causing stumbling and falls and similar accidents, and every management should see to it that the cleaning of floors and passages and the removal of waste is systematically provided for.

Sometimes this condition is due to the habits of the employé himself, and he has to be educated to better ways. At other times floor space is economised and machines and workers are crowded together without due regard to safety in moving about in the confined area. Almost all our mechanical operations can be conducted under pleasanter and safer conditions than at present, so far at least as light and cleanliness are concerned. The tidy shop is less costly in the long run than the dirty one, and has a noticeable effect on the morale of the whole establishment.

Extra-High-Pressure Transmission Lines.

(*Discussion at the* Institution of Electrical Engineers, *Newcastle, January 30th.*)

Mr. C. Vernier, in opening the discussion, pointed out that the information given in these papers (see Electrical Review, February 10th and 17th), did not apply to this country, where 20,000 volts was the present limit of pressure. The locations of the large waterfalls in America made long-distance transmission necessary, but the need would not arise in this country until we could get electricity at $\frac{1}{10}$d. per unit, as foreshadowed by Mr. Ferranti. He remarked upon the small amount of notice which the Thury system received in these papers, and proceeded to outline its leading features and advantages. Under local conditions comparative prices for steel and wooden poles for a 20,000-volt line would be approximately as follows :—

Steel Towers.		*Wood Poles.*	
Assumed life	36 years	18 years	
" " of galv.	9 years	—	
Span	720 ft.	240 ft.	
Cost of flexible type ...	£12	Three "A" poles erected, complete ...	£18
Erection	£5	Renewal of poles ...	£7 10
Painting every third year after nine years	£9	Labour on renewals ...	6 0
Wayleaves	£36	Wayleaves	32 8
	£62		£63 18

The suspension type of insulator was unnecessary in this country, as the need for it did not arise below, say, 35,000 volts. The other types used on overhead work were the pin and the shackle types, the latter of which had been abandoned by the local supply companies on account of its liability to flash over. Any circuit-breaker which allowed an arc to be drawn out was liable to cause surges when operated on load. The surge voltage was approximately independent of the length of the line, and a simple formula for its maximum value was—

$$v = 200 \times c \times \sqrt{2} + e\sqrt{2},$$

where c and e were the R.M.S. values of the current broken, and the voltage between line and neutral respectively. From this formula the maxima for 20,000-volt and 6,000-volt lines were 30,240 volts and 18,900 volts respectively, when breaking 50 amperes, showing that high-pressure lines had a considerably higher factor of safety, as regards surges, than had low-voltage lines. It was not advisable to run telephone wires on H.T. lines, on account of liability to breakage and interference due to induction. According to his experience, it was quite wrong to assume that lines would swing in synchronism, and ample clearance should be allowed.

Mr. B. Welbourne said that the authors had overlooked the possibilities of underground H.T. transmission. Ground wires were useful only as earthing wires. It was certainly not good practice to place a wire where it might fall and do considerable damage by short-circuiting the lines. Flexible towers were being used in the Midlands with success. Tying-in wires should be carried some distance along the wires in order to take up any flashing which might occur, they being easily renewed. Aluminium lines were in successful use in this country, and, contrary to the author's experience, he had found that ice did not adhere so closely to aluminium as to copper. Well creosoted poles should last at least 25 years. He had been struck by the fewness of automatic features in the diagrams shown in the papers.

Mr. J. M. Robb (G.P.O.) pointed out that Norwegian fir was much superior to the Russian variety, but was becoming very scarce. He confirmed that small gauge wires were liable to give trouble through becoming coated with ice.

Messrs. A. L. E. Drummond and J. Pigg confirmed that poles should last for at least 30-40 years.

Mr. S. G. Redman (Merz & M'Lellan) mentioned a case where a steel structure had given way after seven years, but as it was difficult to get wooden poles to carry more than three '15 sq. in. conductors, it would become necessary to use steel towers here if 20,000 volts was to be the limit of pressure. In his experience an unsymmetrical arrangement of the live wires had no effect on the capacity or charging current of the lines.

Mr. P. V. Hunter (Merz & M'Lellan) commented upon the complication shown on some of the diagrams, apparently without any serious attempt towards automatic protection.

Mr. J. Anderson (Newcastle Electric Supply Co.) could not understand how some of the systems could be kept running unless the relays were tied up. He gave some figures to show that under certain circumstances it would pay to carry coal by rail to a large distributing centre rather than to transmit electrically.

Mr. G. L. Porter (N.E.S. Co.) said that capacity current in the pilot limited the use of the Merz-Price system to comparatively short lines, and a 100-mile pilot would have to be of very special construction.

Mr. C. Vernier, in reply to the various speakers, said that ground wires were not much used in the Newcastle district, and the worst case of damage by lightning he had experienced was on a line so protected. His experience with aluminium lines had been unfortunate, and he had had them short-circuit, due to their not swinging synchronously, even when free from ice and after swinging synchronously for over half an hour. In some cases the metal seemed to go soft and lose its strength.

Merz-Price Protective Gear.

By K. Faye-Hansen and G. Harlow.

(*Discussion at the* Institution of Electrical Engineers, Birmingham Local Section, *January 7th*, 1911, *see* Electrical Review, *January 13th.*)

Mr. M. Railing (chairman) said that it was of the utmost importance that every safeguard possible should be used for the protection of life and property; any failure to make use of such protection would be detrimental to their interests and industries.

Mr. A. M. Taylor said that a short-circuit current might reach a value on a large system of, perhaps, 5,000 amperes in $\frac{1}{100}$ second, whereas the oil switch would not clear the fault under, perhaps, $\frac{1}{4}$ second. Long before the relay itself had therefore operated, much less the switch, the current had reached a value several times in excess of the 500-amperes normal tripping current. The speaker had devised a switch which would open the circuit in $\frac{1}{100}$ second; or would, if desired, simply cut down the current so that a dangerous value was never reached, breaking it as the wave passed through zero, in the manner indicated on the diagram C, fig. 1. The use of pilot wires was a serious drawback to an otherwise highly-desirable system. To meet the case where, in a large town, high-tension ring mains had already been installed without pilot wires, and in which the cost of the reopening of the streets in busy thoroughfares was therefore a serious question, he had considered the possibility of doing without pilot wires, by introducing a discriminating system depending on the momentary drop of potential on the occasion of a fault current. Any ordinary reverse-current relay was, of course, useless for this as all the relays on the one side of the fault would act together; but if a relay could be devised which would only respond to the position on the ring at which the *maximum* drop occurred, and which was unaffected by the passage of ordinary "load" currents (no matter in which direction they flowed through it), and in which, moreover, the action was the more positive the greater the drop in E.M.F., then it seemed to him that protection might be obtained, even on a ring main, without any pilot wires. He believed it was possible to design such a form of relay. The "earth fault" and "phase-to-phase fault" currents would have to be limited to a fixed maximum; but this was not difficult, and the same arrangement that limited the phase-to-phase faults would protect any rotaries on the system from being thrown out of synchronism; this, too, without introducing inductance into the system under normal conditions. He believed that it would be quite possible to discriminate between consumers who were only ¼ mile apart; and, if necessary, even closer than this. For longer distances the problem became correspondingly more easy.

Mr. A. D. Chamen said the authors stated that the Merz-Price system did away with relays and batteries, and that this was an advantage. He considered it to be quite the reverse. It was quite easy with the battery and relay to go round occasionally and trip each relay with the finger in order to see that it was operating satisfactorily. He did not see how this could be ensured with the

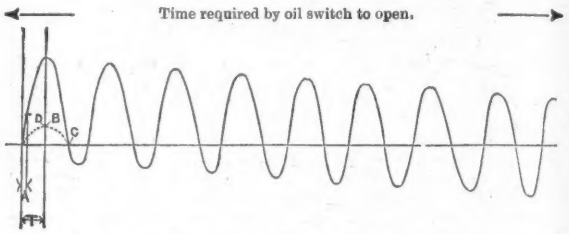

Fig. 1.—A, time required by Taylor switch to operate; C, alternative point of operation; B, wave controlled by the insertion of resistance; T, time of attaining maximum current.

system under discussion. Also, it was far more necessary to keep the Merz-Price gear in thorough order than the overload gear, for if the switch should stick, or for other reasons the apparatus should fail, then the fault came back on the generators, and without some overload device the result would be a complete shutdown. He considered they should not do away altogether with overload relays. There should be a certain number of time-limits put in, in different places, on a carefully thought-out system.

Dr. Kloss thought that the greatest advantage of the Merz-Price system was its capability of cutting out a fault during its development, without waiting for the fault to develop into a short circuit or allowing the voltage of the system to drop to an undesirable extent. With regard to Mr. Taylor's remarks on quick-break switches, the time of break should never be less than one-quarter period, as otherwise dangerous stresses might be produced in the insulation.

Dr. Garrard said that the pilot cable was the great disadvantage of the Merz-Price system, and a system with a maze of pilot wires run everywhere was to be strongly deprecated. The most useful sphere of application was in the case of an interconnector, or any cable in which power might flow properly in either direction. Generator or switchboard faults were best provided against by the use of reverse-power relays fitted with a time lag. On ordinary feeders one had to have an overload relay on the outgoing side, and he thought that this, combined with a reverse power relay at the far end, was quite sufficient. He agreed that the best way the M.-P. system could be applied was the balanced-current method. Where a large amount of generating plant was connected to one common network, the consequences of a breakdown were apt to be disastrous. He would, in many cases, prefer to break the ring mains into sections and arrange to give a consumer an alternative supply from either of two separate generating stations.

Mr. Harlow, in reply, said that he had seen a main short-circuited, with 20,000 kw. behind it, and synchronous machinery running at either end which was quite unaffected; there was no doubt that the gear cut out with extreme efficiency. It must be remembered that the resistance of the cable limited the short-circuit current to a value considerably less than would be given by the generators alone. In the majority of cases the maximum short-circuit current would not exceed about 15 times the full-load current. In addition to this, the iron of the transformer would become saturated and prevent the secondary voltages rising to excessive values. For testing purposes, with the balanced-current system set to operate with 100 per cent. of full-load current, the relays would operate if the pilot wire were broken and 30 per cent. of the full-load current sent through the feeder, a condition very easily obtained. They had both air-gap and iron-closed transformers installed on a balanced-voltage system, and found the balance considerably easier to obtain with the closed-circuit transformers. He agreed with Mr. Chamen that time limit relays should be used at the generating station and instantaneous relays on the outlying feeders. Dr. Garrard's remarks on damage to the pilot wire were quite true, and it had to be tested often and thoroughly. One advantage of the balanced-current system was that it cut out if the pilot wire broke

Physical Society of London.

AT the meeting held January 27th, "A Demonstration of the Phase Difference between the Primary and Secondary Currents of a Transformer by Means of Simple Apparatus," was given by PROF. F. T. TROUTON, F.R.S.

A paper entitled, "A Note on the Experimental Measurement of the High-Frequency Resistance of Wires," was read by PROF. J. A. FLEMING, F.R.S. The author referred to a paper read by him in December, 1909, before the Institution of Electrical Engineers, in which he described an apparatus consisting of a differential air thermometer having tubular bulbs into which similar wires could be placed, and by means of which a comparison could be made of the high frequency (H.F.) resistance R′ of a straight wire and its steady or ohmic resistance R. If two equal wires have passed through one, a steady current A, and through the other a H.F. current A_1, then if these currents are adjusted until the rate of heat evolution in each case is the same, we have $A^2 R = A_1^2 R'$. By means of correct-reading H.F. ammeters as devised by the author, the ratio of the resistances R'/R can be determined from the ratio of the mean square currents A^2/A_1^2.

It was shown that the results for straight wires agreed very well with the formulæ given by Lord Kelvin and by Dr. A. Russell for the ratio R'/R for wires of different sizes and for different frequency. The correction to be applied for damped oscillations as compared with persistent oscillations was at most 1 per cent. in the cases measured. The resistance R″ of a spiral is greater than that of the same wire R′ stretched out straight. In the cases examined the ratio R''/R exceeds R'/R by about 50 to 80 per cent.

Papers on "The Measurements of Energy Losses in Condensers Traversed by High-Frequency Electric Oscillations," and "Some Resonance Curves taken with Impact and Spark Ball Dischargers," by PROF. J. A. FLEMING and MR. G. B. DYKE, was read by PROF. FLEMING.

In the course of the experiments described on the measurement of energy losses in condensers, a large number of measurements had to be made with the cymometer of the frequency of oscillations in, and the inductance of, the secondary or condenser circuit. It was then an easy matter to draw complete resonance curves in each case, and this has accordingly been done with both the impact and spark ball dischargers in the primary circuit and for various resistances in the secondary circuit. Using the spark ball discharger for any close coupling, we find on the resonance curve three peaks which correspond respectively, as regards frequency, with the free oscillation period of the secondary and with the two-period oscillations set up by the reaction of the secondary upon the primary circuit. As the coupling is weakened the double-period oscillations die out, and only the free oscillation of the secondary survives. There is always a certain coupling, not far from 10 per cent., which gives the maximum current in the secondary circuit in the form of a free oscillation.

Using an impact discharger, the double-period oscillations are only apparent when the coupling exceeds about 30 per cent., and die away with a very little reduction in the coupling, leaving the predominant free secondary oscillation as the survivor. These curves show how very quickly the primary spark is quenched when using the impact discharger.

Air and Oil as High-Voltage Insulators.

IN the course of a paper read before the American Institute of Electrical Engineers on January 13th, Prof. H. J. Ryan deals with the corona problem in high-pressure transmission.

After explaining the nature and properties of ions, he says :—

The sources of ionisation about high-voltage transmission lines are :—

Radioactivity that is entirely natural in the open air ; impact of ions at the surfaces of conductors caused by the electric field ; and collision of ions and atoms when the field exceeds the critical ionising strength.

Whenever an ion, under the influence of an electric field, collides with an atom, they "ionise by collision"—*i.e.*, each electron that strikes an atom of air in a stress above 76 kilovolts per in. does so at sufficient velocity to detach from such atom an electron. Two new ions are thus formed : the negative electron and the neutral atom which lost it, and which was thereby given a corresponding positive charge and became a positive ion. The negative ion collides with the next atom, and thus the ionisation process builds up rapidly by geometric progression. Ionisation by collision is always accompanied by luminosity, and is the cause of visible corona, part corona, brush discharge, sparks and ultimately arcs. Corona for all cases is simply a spark discharge phenomenon wherein the conductor is one electrode and the air conducting by diffusion is the other.

Under practical conditions, therefore, no corona will form on electrodes of either sign without a natural source of ionisation, and none will be formed at the negative electrode without some form of negative ionisation at its surface or very near thereto. The known sources of negative ions at the surface of the cathode conductor are impact of positive incoming ions, radioactive emanations (dirt captured by the cathode and near the surface) and collision with neutral ions. Of these three, impact is of predominating influence.

Each conductor is enclosed by a zone or envelope, having a depth of a few inches, within which the total stock of captured ions are actively moving to and fro. The formation of such a collision ionisation envelope about the conductors of a high-voltage transmission line is the fundamental feature of corona. Under normal atmospheric conditions, the critical stress required to start ionisation collision when regularly distributed is 76,000 volts per in. at a critical striking distance depending upon the distance between conductors and their diameter. This critical stress varies directly as the barometric pressure and inversely as the absolute temperature.

His conclusions in regard to the open atmosphere as an insulator are as follows :—

1. Ionisation and the travel of ions under electric stresses are the causes of failure of the open atmosphere as an insulator and they are the cause of corona formation.

2. All ordinary failures of the atmosphere under stress are developed through ionisation by collision, which can be started under usual high-voltage electric stresses through the presence of some natural or antecedent supply of ions.

3. Variation in the supply of natural ions in open air is the cause of the erratic variation of critical loss-voltages. Such variations have little effect upon the values of the part-corona voltage that has increased the atmosphere loss by the small amount equal to the loss caused by the inevitable ion-convection current.

4. The figure of the electric field about the high-voltage conductors determines the facility with which the migrating ions will concentrate the electric stress near the surface of the conductor, and thus render the resulting corona irregular at all stages, causing it to be started and to be maintained at correspondingly lower voltages.

5. The turbulent elements introduced by variations in the amount of natural ionisation have so small an effect upon the corona forming pressures, and the field irregularity factor above referred to is so nearly constant over a wide range of conditions that the rational formula as developed should be found dependable to a reasonable extent.

6. The term "dielectric strength" as applied to the open atmosphere, from the inherent nature of things, can have no definite meaning.

7. The rupturing strength of the normal atmosphere rests upon two factors only, (1) quantity of ionisation produced by the rupturing voltage, (2) the distance between the electrodes. The rupturing gradient varies from 300 kilovolts per in. (120 kilovolts per cm.) at lowest ionisation to 3 kilovolts per in. (1·2 kilovolts per cm.) at highest ionisation, with no indication that the limits at either end of this range have as yet been found.

In regard to dry transformer oil as an insulator, he says :—

1. The failure of the oil as an insulator is due to ions liberated by the electric stress from the supply of free ions in the metals of the electrodes.

2. The electric stress required to detach ions from metals to the oil is much lower than the corresponding stress for a gas.

3. The further conclusion follows necessarily that a compressed gas must, in regard to insulating quality alone, be superior to oil.—*Journal of Electricity, Power and Gas.*

Recent Progress in Mining Switchgear.

AT a meeting of the MINING INSTITUTION OF SCOTLAND, held on the 8th inst. at Glasgow, a discussion took place on the paper contributed by Mr. George Stevenson, A.M.Inst.C.E., on the subject of "Recent Progress in Mining Switchgear." A summary of the paper has already appeared in our columns.

MR. ALEXANDER ANDERSON (Motherwell) said that he did not see what the author was driving at in certain of his references to "electrical switchgear phenomena." On the question of underground switchgear he was very apt to lead the members astray. For example, he began by saying, "Switches may be single, double or triple-pole, according to conditions, and in the case of small lighting circuits single-pole switches are as a rule sufficient." In his (Mr. Anderson's) view no circuit of double wiring should have less than a double-pole switch. In Scotland to-day they had more direct current than three-phase plant, and it might have led to a profitable discussion had Mr. Stevenson shown them the advantages of oil, for instance, in preference to flame-proof switches.

MR. DAVID MARTIN (Glasgow) said that under the heading relating to "electrical circuit phenomena," Mr. Stevenson asked whether it was necessary to have the switch near the generator or not ; if he attempted to do without one at both the generator end and the motor end, he would get into trouble with the Board of Trade and the Home Office. He would like to have the author's views on the subject of capacity effects on switches, seeing he had dealt in his paper with other effects of lesser importance. "It is very probable," Mr. Stevenson stated, "that in breaking the shunt or field circuit of a continuous-current dynamo, the resultant spark may be more virulent than that of breaking the main circuit." On that point there was no question. The use of a shunt break short-circuiting device was standard practice for all conditions where it was necessary to break the field excitation current, and this was done through an ohmic resistance. In the course of his paper, the author advocated the use of material which was not fragile, yet in the view of a switch shown on the screen, he observed that he favoured the use of a porcelain into which were fixed steel rods hanging in a vertical position. In making or in closing the switch the porcelain was under considerable mechanical strains, and he would ask if that was quite safe for porcelain of that shape, which, moreover, was so fragile. Would it not be better, as adopted in another make, to use a horizontal rod of steel with sleeves for each phase carrying the switch contacts clamped on to the porcelain sleeves ? The use of oil was the result of a series of experiments carried out by Mr. Ferranti some years ago. The cellular type advocated by Mr. Stevenson was quite good, but in his opinion

it was not the best. Indeed, the cellular type, originally of Mr. Ferranti's invention, was now an obsolete type after the disastrous fire at Bristol some six or seven years ago. In the paper he had looked for some remarks upon the more recent inventions of flame-proof switchgear which were now so clamantly called for in connection with underground use.

Mr. Stevenson, in the course of his reply, said that the company with which he was now connected at one time used wood for the switches; that, however, they had entirely discarded in favour of porcelain, as the result of tests and experiments, which had completely shown that porcelain was superior to wood. He was of opinion that porcelain taken in conjunction with fixed steel rods hanging in a vertical position was infinitely better than the method Mr. Martin advocated. Wood ought not under any circumstances to be used down a pit in connection with switches. The switch which he had shown was now being manufactured in very large quantities and had proved to be highly satisfactory. The bulk of the plant in this country was high-tension plant, and certainly for that the cellular type of switchgear had, after a great many years' experience, proved to be the superior.

A "Telephone Authority" for Great Britain.

At a meeting of the London Chamber of Commerce on February 17th, Mr. H. Laws Webb read a paper on this subject. After pointing out that the State provided a telegraph service, principally used by business men and the racing community, at an annual loss of about a million sterling, he said that there was no real reason for supposing that the telegraphs of a country should necessarily be a Government monopoly; on the Continent the telegraph system was often primarily part of the machinery of Government, but that did not apply to this country. All the pioneer work had been done by private enterprise, the submarine cable service of the world was operated at very high efficiency by private enterprise, and the telegraphs of North America were also conducted satisfactorily by that means. The State telegraph monopoly was set up 40 years ago as a business proposition, and it should be judged on that basis.

The original estimate for the purchase of the properties of the six telegraph companies was 2½ millions; two years later the estimate was raised to over 3 millions, and it was stated that the system could be worked at a profit sufficient to meet interest and sinking-fund charges, amounting jointly to nearly 6 per cent. But by the time the Telegraph Act was passed, the estimate was increased to 7 millions; nevertheless, by manipulating the estimates of gross revenue and working expenses, a balance of profit was still shown on paper. Within a few years after the purchase, the expenditure had risen to 11 millions; the working expenses, which in 1870 were 51·8 per cent. of the revenue, three years later were over 90 per cent., and for many years now they had been over 100 per cent. No payments had been made to sinking fund to extinguish the original capital, the interest on which had to be paid by the taxpayer, who also supplied all the additional capital for the development of the system. The total expenditure to date was about 35 millions, on which there was no return whatever, as the revenue did not cover the working expenses.

The lecturer stated that the reason for the failure of the Government was that under political control a technical business could not be operated on business lines. There was constant pressure brought by the public, or by bodies having political influence, to obtain reduction in rates, and by the staff to obtain improvements in pay and conditions. Moreover, it was a well-known fact that the same general efficiency of staff could not be obtained in a Government department, where employment was permanent, as in private employ, where pay and promotion depended upon efficiency. Within four years of the purchase the working expenses had more than doubled, though the increase of traffic was only 50 per cent. Within six months the staff numbered nearly three times the estimated staff, and more than double the aggregate staff of the telegraph companies that were taken over. These facts were brought out by a Committee of inquiry in 1875, which found that the ratio of working expenses to gross revenue had risen from 57 per cent. to over 96 per cent. within four years. Since then there had been no further inquiry, and matters had been allowed to drift. The price paid for the telegraph properties had nothing to do with the financial results, as there was an actual loss on working.

Notwithstanding all the improvements made in telegraphy during the past 40 years, the working cost per message was higher to-day than it was 40 years ago.

The Post Office originally disclaimed the desire for a monopoly, expecting to beat all comers in efficiency and economy, and the first Select Committee which examined the Telegraph Bill reported that a monopoly was not desirable; later, however, the Post Office pressed for and obtained a legal monopoly, lest opposing schemes should be started for the purpose of being bought out.

Although, when the telephone was introduced, it was declared to be legally a telegraph, the Post Office, in 1880, preferred not to go into the telephone business, but granted licences on a royalty of 10 per cent. of the gross receipts from telephone exchange business. The withholding from the telephone companies of statutory powers to run their wires had wrought them great injury, and the limited life of the licence, expiring at the end of 1911, had placed the telephone companies in an extremely difficult position; these adverse conditions had prevented any broad policy of development of the telephone, and the British public had been the sufferers. At present there were 644,000 telephones in service in the United Kingdom, whereas if the telephone service had been developed in proportion to the population, as it had been in the United States, there should have been nearly 3,000,000 telephones in service. The widely developed and highly efficient telephone service in America was recognised as one of the most important factors contributing to the commercial and industrial efficiency of the United States. Unlike the State telegraphs, the telephone service had been subjected to frequent inquiries and changes of Government policy. The policy of municipal and Post Office competition with the Post Office's licensee, adopted in 1899, had proved a failure, and under the agreement of 1905 the National Telephone Co. had to sell its property to the P.M.G at its value as working plant, the present prospect being that the telephone business would shortly become a complete State monopoly.

No business man, he believed, looked forward without apprehension to the establishment of a State monopoly in the telephone, or expected either high efficiency or wide development under the political control and uncommercial methods of a Government department. The initial error was made 40 years ago, when the Post Office was granted a monopoly in the telegraphs, which, as a recent P.M.G. had said, were past praying for. No business man wished to see the telephones go the same way. Even if the Government telephone service showed a profit, it would not be developed at an adequate rate, because the financial control would vest in the Treasury, and not in those directly responsible for the conduct of the business.

The business man wanted a highly developed and highly efficient telephone service, and was perfectly willing to pay a fair price for it. To secure its adequate development several millions a year would be required for many years to come, and it was essential that the matter should be handled on commercial lines. Both private enterprise and State monopoly met with strong opposition; a middle course could be found by establishing a Telephone Authority on the lines of the Port of London Authority, to take over, operate and develop the telephone service of the whole country on commercial lines, forming a single homogeneous system. The financial operation involved would be of considerable magnitude, but presented no insuperable difficulties; and the difficulties were nothing compared with the advantages of placing the whole telephone business under a single Telephone Authority, which would be a commercial body and would readily obtain the continuous flow of new capital necessary for the rapid development of the telephone service, which for some years had been almost in a state of arrested development. The Telephone Authority would take over the staffs of the National Telephone Co. and of the Post Office Telephone service, with advantage to the business, and at the same time would allay the feeling of unrest in a large body of skilled workers. Political agitation had become permanently established among all branches of the Post Office staff, and the addition of 18,000 employés to that staff, which would occur under the contemplated transfer to the Post Office, was calculated to increase that agitation. Their number would increase very greatly if the telephone service was adequately developed, but under commercial management political agitation would entirely disappear. A royalty would be paid to the Post Office, which would in time, no doubt, more than fill up the annual telegraph deficit. The present agitation being conducted by municipalities and Chambers of Commerce was, in his opinion, misguided, being based on the question of rates, whereas the main thing to aim at was wider development and more efficient service; these granted, the business public would never grumble at reasonable rates which would enable those results to be accomplished. He hoped that the London Chamber of Commerce would use its great influence to prevent the telephone service from being consigned to the stagnation of a State monopoly.

Moving a vote of thanks, Mr. Stanley Machin emphasised the danger due to political pressure of employés, which was acknowledged by the Postmaster-General, and on the score of efficiency he stated that the American suburban service up to 30 or 40 miles was as quick as the local service, while on trunk calls there was rarely a delay of 10 minutes. The Chamber had delegated its Executive Committee to look into the whole question.

Mr. Bartholomew hoped the Chamber would take the matter up vigorously; nothing could be worse than that the telephone business should fall into the hands of the Post Office.

Mr. Tomalin agreed that no material reduction in the rates could be hoped for, but the Post Office would be a "telephone authority," and had conducted the postal service so well that it should be able to handle the telephones equally well.

Mr. Gerard Smith was delighted to hear that the London Chamber of Commerce was taking up the matter, and agreed fully with Mr. Webb. The Telephone Committee of the Associated Chambers had wasted time on the subject of rates and in supporting the obsolete flat rate; already charitable institutions were petitioning for free service. He hoped it was not too late to act.

In his reply, Mr. Webb said that the Post Office had had the trunk service since 1892, and it left much to be desired; delays of one or two hours were fatal to efficiency. The postal service was conducted by non-technical and unskilled labour, with other people's plant (railways, &c.), and was a totally different matter to the highly technical business of telephony. If they gave a good service, the rate question would take care of itself. The telephone agreement could be dissolved by mutual consent, and there was ample time if the London Chamber of Commerce would take the matter up.

The Earl of Desborough, who presided, also referred to the deficiencies of the trunk service and to the great evils of political pressure by civil servants.

Mansfield Lighting.—The T.C. has decided to extend the E.L. mains in the direction of Newgate Lane, Skerry Hill and Carter Lane, at a cost of £500.

WORKS COSTS.

By CHARLES C. GARRARD, M.I.E.E.

(*Continued from page* 252.)

Establishment Charges.—By establishment charges are meant all costs other than material and labour, as set forth above, but exclusive of depreciation and interest, which are charged directly in the profit and loss account. Generally, the account is divided into two, viz., shop establishment and general establishment, and this is very advantageous for controlling expenditure, but for the present purpose we may consider the charges as a single account. It may be said at once that upon the proper treatment of the establishment charges, a large part of the success of the cost-keeping system depends. The idea is to keep the establishment account as a running account, debiting it with the expenses incurred on the one hand, and crediting it on the other hand with the amounts allocated to the various works order numbers. It is this weekly or monthly allocation of the shop establishment account to the various works order numbers, which differentiates the proper system from the method often followed, in which the establishment account simply consists of a list of the expenses incurred, which is added up at the end of the year for making up the accounts. By allocating the establishment charges weekly or monthly to the various jobs, it is possible to get at the true costs; and, moreover, by watching the relative size of the account to exercise a definite control over the same.

Now, it is obvious that as the establishment charges are not direct costs, the booking of the same to a job must be made upon a certain system, and what system is to be adopted must depend upon circumstances, as it is quite obvious that the establishment charge upon £1 labour spent upon a large machine tool must be larger than that upon £1 labour on bench work. The point to bear in mind, however, is that for every job the cost of establishment charge is just as fixed as the cost of labour or material. It is no good to fix upon an arbitrary percentage—say, 150 per cent. of the labour, and call this the establishment charge. This is putting the cart before the horse. The establishment charge is fixed by the works expenses. These must be firstly determined, and a formula found which will divide the total amount fairly among all the jobs carried out during the period over which the expenses are taken. Generally speaking, each department in the works will have its own establishment charge, and a separate establishment account must be kept for each department. As we have expressly excluded depreciation and interest from the establishment charges, there can be little doubt that their expression as a percentage of the labour is correct, and is, moreover, the most convenient method. The total establishment expenses are totalled up, therefore, per month, and divided by the total labour spent (in the department) for the same period, and the percentage thus found is used for making the allocation during that month. The establishment account, therefore, reads as follows:—

Establishment Account.

Dr.			Cr.		
1910.			1910.		
Jan. to Dec.	To expenses.. ..		Jan. to Dec.	By allocations to manufacturing account as follows:—	
	,, salaries	£250		,, W.O. No. 10 ..	£150
	,, light			,, W.O. No. 20 ..	100
	,, power, &c. ..			,, W.O. No. 30, &c...	20
	,, loss orders ..	20			
		£270			£270

Fig. 2.

Generally the establishment account will not balance exactly at the year's end as the credits have all been made on the basis of a percentage on the labour costs. The difference, however, will be but small and can be dealt with easily. For the purpose of obtaining a quick review of the account, it is useful to plot it as a curve both as a percentage and as total amount, and if these curves are preserved and compared from year to year many interesting results may be obtained.

Manufacturing Account.—It is clear from the foregoing that there will be a separate set of entries in the manufacturing account for each works order number as follows:—

Manufacturing Account.

Dr.				Cr.		
1910.				1910.		
Jan. 1.	To value of work in hand		£1,100	Jan. to Dec. 31st	By sales of work in hand at Jan. 1st	£1,300
Jan. to Dec.	,, costs on W.O. No 10— wages .. £100			Dec.	,, sales W.O. No. 10 ..	1,100
	stores .. 700				,, sales W.O. No. 20 ..	750
	establishment 150				,, W.O. 30 transferred to stock	235
		950		Dec. 31st	,, value of work in hand	1,200
	,, costs on W.O. No. 20— wages .. £75					
	stores .. 500					
	establishment 100					
		675				
	,, costs on W.O. No. 30— wages .. £15					
	stores .. 200					
	establishment 20					
		235				
	&c., &c.					
	,, costs incurred on work in hand ..		1,200			
Dec. 31st.	,, gross profit on manufacturing account		425			
			£4,585			£4,585

Fig. 3.

The above balance will not be the total trading profit, as from it must be subtracted the depreciation of the stores stock, and to it must be added the profit of the stores trading account; in short, a works trading account will be made out at the end of the year in the usual manner, which, taking everything into consideration, will show the gross profit which is carried to the profit and loss account.

Stores Trading Account.—As explained above, the stores account should balance as everything should go out at the same price as it comes in. However, there will be many sales effected directly from stock, for example, stock parts or finished goods held in stock. These goods will be sold naturally at an increased price, and the transaction should be dealt with by means of a stores trading account. The goods are debited to this account at the stores value, *i.e.*, at their cost, or if depreciated at their depreciated value, and being credited to the stores trading account at their sale price, the profit is shown in this account, and does not confuse the stores books.

Stock Orders.—A large amount of the manufacturing will consist of the manufacture of stock parts or completely finished articles for stock. For this purpose stock orders are issued, and are costed and treated in exactly the same manner as orders from outside. When completed the shop will send the goods into the stores, and a transfer is made from the manufacturing account to the stores account at their cost price. The establishment cost of a certain article is naturally the same, whether it be made for stock or for a definite order. It costs just the same to put through in either case. If the stock article, however, be not sold at the end of the year, it would generally be inadvisable to carry it over at its full cost value. In this case it will be valued in the stock at some less value than the manufacturing cost, the difference being debited to depreciation as stated above.

Loss Orders.—In discussing the question of the recording of the true labour cost, the result was arrived at that this should be the piece-work price. A number of cases will occur, however, in which the amount paid for labour will be in excess of the normal piece-work price. For example, we may suppose a casting is partly machined, when it is discovered that it is a scrapper. A new one has to be procured and a certain amount of labour done over again. To take care of this transaction, a loss order is issued, which is treated in exactly the same manner as another works order number—that is to say, it is charged with the extra material, labour, and corresponding establishment charge. In a similar way, loss orders are issued in all cases where work has to be carried out in connection with losses, as, for example, due to faulty raw material, mistakes on drawings or works instructions, &c.—in fact, in all cases of exceptional and extra work which could not have been foreseen and will not be repeated in the usual normal run of affairs. In a workshop, working entirely on piece work, the labour ticket for the loss order will have to be priced before the work is executed. This is a frequent source of trouble, as it is very difficult to price such work accurately, and moreover, by the nature of the thing, the pricing must be done without delay and on the spur of the moment. It will be unnecessary to point out, therefore, that the matter should be dealt with by the most discreet and experienced man available.

This system of loss orders is extremely useful when manufacturing is carried on in accordance with a pre-estimated price. In these days of keen competition it often happens that an order can only be obtained after the cost of every operation has been worked out previously, so as to get the price down to a minimum. In giving out the work in the shop, these prices, or, if possible, lower ones, will be worked to, and if everything follows a normal course, the costs will come out on the right side. It sometimes happens, however, that something goes wrong on the job. If, now, the extra cost of this were to be mixed up with the normal cost, it would not be apparent that the excess was in the nature of an accident, which, although guarded against in the future, must yet be treated as such. The record, therefore, will stand that the cost of the job is so and so much, but that on this particular occasion loss orders, number so and so, were issued in connection with the work for such and such reasons.

As regards the book-keeping of loss orders, each department will have its "loss account," to which the total cost of each loss order in that department will be charged. Every month (or week) the total of this loss account will be transferred to the establishment account, and thus will be spread eventually by means of the allocations to the various works order numbers over the whole of the work going through the departments. This may not appear at first sight a very logical thing to do. Further consideration, however, we think, will convince one that this method is undoubtedly the right one to follow. Firstly, it affords a very convenient way of dealing with the account. Secondly, it must be remembered that in an imperfect world a certain number of mistakes are bound to occur. The most successful manufacturer is the one who makes relatively the least. At any particular instant, therefore, all the jobs which are going through the shop are incurring a definite and specific risk of accident. A proportional number will go wrong, but which, will depend to a certain extent upon chance. It is right, therefore, that the cost of what accidents do occur should be spread as a general charge over the whole of the work going through. The loss account is cleared, therefore, every month (or week), and it is not necessary to make a large adjustment at the end of the year.

Following up the idea above enunciated, that a certain amount of loss must be reckoned with always, it is clear that the proper way to control the loss account is as a percentage of the total costs. A running record should be kept therefore in the form of a curve of the total of loss orders in each department as a percentage of the total costs in that department. The tendency of this curve is the thing to watch. If it continues to go up it is clear that something is wrong in the supervision or elsewhere. In fact, in this matter, as in most others in connection with works costs, the true method of judgment is the comparative one. It is, for example, impossible to say offhand what percentage of losses in a workshop is excessive and what not. It is, however, reasonable not to expect a worse result than that which has been obtained hitherto, and that efficient management will result in a steady tendency for the percentage of losses to diminish.

As stated, a further precaution to be taken is to charge the various loss orders against the department responsible. Thus, for example, if the percentage of loss due to faulty drawings shows an increase, one knows where to look for a remedy. It will be seen that if worked properly, the loss-order system affords a very convenient and complete system for tracking down leakages of profits of every description, and, in fact, may be used as an instrument of management second only to a proper system of keeping of costs.

Losses in Connection with Overtime and Night Work.—When a night shift is being worked, the piece-work rates for a particular job will often be higher for the night work than if the job were carried out in the daytime. Now, it is clearly a matter of chance which particular article gets made in the night and which in the daytime, and it would be illogical to say that the one cost more than the other, as the night-work article could have been made cheaper if it had not been crowded out of the daytime by the other job. In both cases, therefore, the normal day-work price should be recorded as the cost, and the difference in actual cost of production should be booked to loss account, which will eventually be included in the general charges. The effect of this is that the penalty of running a night shift is to increase the absolute amount of general charges. The criterion as to whether the night shift does not pay, will be if the relative amount of general charges be increased, taking into account the increased output. This method forms a very convenient one for determining the desirability of night work, but, unfortunately, when it comes to this question, one's hands are forced generally by the question of delivery to time. Nevertheless, the total increase of general charges due to night work should always be worked out in this manner, as it is quite possible under certain circumstances, if one must run a night shift, to wipe out a running loss by increasing the amount of work done in the night, the increased output counteracting the increase in general charges.

The same considerations apply to overtime. It is the custom in most establishments to credit the piece worker with an amount corresponding to the difference in his time rates when on ordinary time and when on overtime. Thus, if his hourly rate be 8d., his rate on overtime will be 10d., and if he works for two hours' overtime he is credited with 4d. in addition to what he earns at piecework. This is clearly in the nature of a loss not applicable to any particular job which the man may be engaged upon late in the evening (or when working overtime) but which should be charged to loss account, and dealt with as above. The same remarks apply when a piece worker, who may be in debt, is discharged or leaves. The loss thus incurred should be spread over the whole of the work going through in the manner stated above.

Schedules.—(a) Of Material.—The complete schedule of material required on a job has been mentioned above. I would like to draw particular attention to this point, as it is of importance. For every works order number a schedule must be issued by the office, whether it be a stock order or a customer's order. This schedule must be absolutely complete, and contain all the material that must be issued from the stores for the job. Articles which have to be ordered outside will be marked with this information, and a copy of the schedule will be sent to the purchasing department, who will send out the order and mark the schedule with their order number and name of supplier, so that the stores may know where to exert pressure to get the goods in promptly. An important point about the schedule is that the material must be enumerated in the form in which it is to be given out by the stores. Thus, if it be bar for cutting up, it must be scheduled as in multiple lengths of so and so allowing for length required to part off. In many cases the material to be issued will be standard component parts, and these must be called for under their stock numbers. In addition, the schedule must state the drawing numbers required so that these may be issued when the work is put into the shop. For standard and repetition work the schedules may be printed, leaving only blank spaces for the quantities to be filled in.

(*b*) *of Operations.*—The operation schedule is now in use in many up-to-date works. The old-fashioned system wherein the foreman took his drawing and determined the operations, the order in which they were to be done, &c., is no longer followed. Naturally, the foremen have to be consulted in the drawing up of the list of operations, but when this has been done the information is put on the operation schedule with the consecutive order in which the work is to be done and any other information that may be desirable. Against each operation is entered the piece-work price and the numbers

Operation Schedule No. .....

Part .....

Drawing No. ..... Stock Nos. ..... Stock Sheet No. .....

Ref.	Operation.		Piece work price.	Tool No.	Minimum quantity to go through at once.	Remarks.

Fig. 4.

of the tools and jigs which it is necessary to issue for the work. A suitable ruling for such an operation schedule is shown in fig. 4, but naturally this may be varied to meet the requirements of the different classes of work. The sheets,

however, should be all of one size, mounted on cloth and carefully indexed.

The greatest advantage, of course, of this system of operation schedules, comes in repetition work, and as the tendency nowadays is more and more towards standardisation, its merits will be the more and more evident. Once the list of operations and their prices have been fixed, the management may rest assured as to the capability of the works to repeat any job in at least as economical a manner as before, as alterations of the operations and prices are only allowed after full discussion and settlement that the proposed change is beneficial. The operation schedules are filed in the price-fixer's office. The schedule of material and the drawings which are issued when the job is put in hand, state the number of the operation schedule. This is turned up, and the job tickets can be made out at once with the minimum of delay and trouble. If, as the result of carrying the work through, a more expeditious or better method is discovered, a note of this is at once entered on the operation schedule. Thus, although the work may not be repeated for a lengthy period, the experience gained is not lost, but is always ready for reference, and, moreover, as the operation schedule *must* be referred to before the piecework job tickets are made out, the information available cannot be overlooked, even if the persons immediately concerned have personally forgotten all about the matter.

(*To be concluded.*)

FOREIGN AND COLONIAL TARIFFS ON ELECTRICAL GOODS.

SWITZERLAND.

The following duties are payable :—

25 francs = £1. Kg. = 2·204 lb.

	Francs per 100 kg.
Dynamo-electric machines and electrical transformers, weighing each :	
50,000 kg. or more	5
From 10,000 to 50,000 kg. exclusive	6
„ 2,500 to 10,000 „ „	6·50
„ 500 to 2,500 „ „	8
„ 100 to 500 „ „	11
Less than 100 kg.	14
N.B.—Machines forming a single entity with a dynamo, generator or with a motor, are not regarded as dynamo-electric.	
Electric locomotives	10
Electric lamps :	
Arc	6
Incandescent :	
With sockets	50
Without sockets	80
Insulators, mounted	6
Accumulators and plates for the same, electric batteries and piles, mounted electrodes :	
Combined with india-rubber or celluloid	10
Other	8
Current recorders, and other instruments for measuring electrical power, pressure, &c., and finished accessories for the same	20
Telegraph and telephone apparatus	12
Commutators, automatic cut-outs, rheostats, regulators, resistances and other apparatus not specially mentioned	8
Copper wire	3
Electric cables of all kinds :	
Not insulated	12
With the core insulated with india-rubber, gutta-percha or paper, not covered with textile material twisted or plaited :	
With lead sheathing	12
Without lead sheathing ; insulated wires	18
Covered with wire or with silk twisted or plaited :	
With lead sheathing	12
Without lead sheathing	15
Wares of copper or copper alloys, not otherwise mentioned :	
Rough, not turned	15
Turned, not polished nor dulled	20
Polished, dulled	35
Nickelled, oxidised, painted, varnished	40
Gilt, silvered	50
Bronze wares, simply moulded	10
„ „ other	60
Leather belting	35
Carbons prepared for electric arc light, carbon candles for electric light, galvanic carbons in cylinders, sheets, &c., gas carbons for electric batteries	6
Electrodes, not mounted	·50
Asbestos and mica in sheets, cut out, or in frames combined or not with tissues, metals, &c.	3
Ditto in tissues, plaits, string, cord, pipes, reels, &c., combined with metals, rubber or other materials (includes insulating materials of all kinds)	12
Insulators made of porcelain	·50
Insulating bowls and tubes of glass for electric accumulators, glass insulators	4
Rails and sleepers for railways :	
Weighing 15 kg. or more per metre	·30
Weighing less than 15 kg. per metre :	
Not pierced nor curved	2
Pierced or curved	3
N.B.—The duty paid on rails used in laying permanent-way of new lines of railway is refunded.	
Rack rails (rails with cogs) ; driving rods ; switches and points ; turntables ; sliding platforms ; portable tracks	4
Axles, springs, tires, wheels, bodies of wheels ; roughly worked, unfinished	·60
Axles and wheels, tires, bodies of wheels, springs for buffers, for drawing or for suspension, finished ; mounted axles ; frames for locomotives and carriages ; disk signals ; loading gauges, weighing—	
200 kg. or more	3
Less than 200 kg.	5
Fishplates and chairs	5
Axle-guards, brake levers, trucks (two-wheeled), coupling screws, safety chains, buffers, traction-hooks, buffer-boxes of wrought-iron, cramp-hooks and linch-pins, wedges, chairs for rack rails, &c.	7
Radiators of non-malleable (grey) cast-iron, and manufactured parts thereof	7
Aluminium wares :	
For industrial or engineering purposes	20
Other	70
Insulating materials of rubber	1
Lamps of all kinds (except arc and incandescent) and finished parts, shades, glass holders, stands unmounted, *i.e.*, not combined with parts of brass, &c., electric pocket lamps with or without battery	25
Glass receptacles for electric batteries	8
Junction boxes, distribution boxes, &c., of porcelain, not mounted	8

Electrical Undertakings in Argentina.—The shareholders in the German Transmarine Electricity Co. have now sanctioned the previously reported proposal to increase the ordinary share capital by £500,000 to £5,000,000. It appears that the whole of the new issue is to be taken over by a banking syndicate at the price of 122 per cent., and shares representing £450,000 will be offered at the price of 130 per cent. to existing shareholders, the syndicate making on this basis a profit of only 2 per cent. owing to the large outlay for stamp tax, &c. The remaining shares of £50,000 are intended for the starting of a market for the shares in Brussels, for which a Belgian syndicate will be formed, and the introduction will pave the way for the whole of the share capital being quoted in Brussels. The Transmarine Electricity Co.'s shares would in this event be listed with those of the Buenos Ayres tramways, which receive a supply of power from the former's stations in Buenos Ayres. At the recent meeting a shareholder suggested that instead of proceeding gradually with increases of capital, the directors should come forward with a grand scheme of expansion, as there is plenty of opportunity in Argentina for projects, seeing that over £30,000,000 of English capital is at work in that country ; and it was desirable, in his opinion, for the Argentine electrical industry to remain in the hands of the group of the Transmarine Electricity Co. The company, which also owns works at Monte Video, Valparaiso and Santiago, intends to publish the receipts of each works separately in the future, whilst the reduction of 10 per cent. in the price of energy at Buenos Ayres, which was recently reported as to come into operation this year, was made in advance some time ago.

Prize Competition.—The Royal Academy of Sciences of Turin, in accordance with the will of Thomas Vallauri, announces that a prize of 26,000 lire (£1,030) will be awarded for the most important achievement in the domain of physical science published during the years 1915-1918 inclusive. Written works will not be eligible.

Glasgow Tramways.—The T.C. has approved of a recommendation by the Tramways Committee that, in connection with all future contracts by the department, provision be made for an adequate sum being retained by the Corporation from the contract price for the period of 12 months from the completion of the contract, as security for the maintenance of the work, except in cases where the personal caution under the contract is considered sufficient. In connection with a request that it should consider the advisability of carrying parcels on the cars, the Tramways Committee has recommended that meantime no action be taken in the matter.

NEW PATENTS APPLIED FOR, 1911.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by Messrs. W. P. Thompson & Co., Electrical Patent Agents, 285, High Holborn, London, W.C., and at Liverpool and Bradford, to whom all inquiries should be addressed.

2,914. "Combination electric radiator (or heater) and humidifier." A. E. Wilson. February 6th.

2,924. "Electric resistances." W. F. Jones. February 6th.

2,926. "Apparatus for the manufacture of electric resistances." J. A. Hirst and P. S. Brook. February 6th.

2,937. "Lampholders for incandescent electric lamps." H. D. Staniar and A. E. Clegg. February 6th.

2,959. "Electric light shade carrier." H. Arthur. February 6th.

2,968. "Electric heaters." M. M. Kohn. February 6th. (Complete.)

2,992. "Shock-absorbers." D. F. Kilgour. February 6th. (Complete.)

3,028. "Mounting electric conductors, more particularly filaments, for incandescent electric lamps." British Thomson-Houston Co., Ltd. (General Electric Co., United States.) February 6th. (Complete.)

3,029. "Mounting electric conductors more particularly applicable to incandescent electric lamp filaments." British Thomson-Houston Co., Ltd. (General Electric Co., United States.) February 6th. (Complete.)

3,036. "Gas-proof electrical make-and-break contact or switch." J. Willis and B. Johnson. February 7th.

3,086. "Systems and mechanism for transmitting electric impulses." G. A. Cardwell. February 7th.

3,088. "Electrical resistances." F. Greenhalgh. February 7th.

3,110. "Current-collecting device for rapidly moving vehicles." W. H. Bell. February 7th.

3,138. "Time control of electric circuits." H. T. Harrison. February 7th.

3,146. "Regulating device for transforming diffusers." A. Kreglewski. (Addition to 1,812/1911. Convention date, May 28th, 1910, Germany.) February 7th. (Complete.)

3,165. "Elevator or hoist for rise and fall electric light fittings and the like." A. J. Ware. February 8th.

3,238. "Electric lighting systems intended more particularly for railway carriages and similar vehicles." Electric and Ordnance Accessories Co., Ltd., F. H. M. Langley and F. W. Price. February 8th.

3,251. "Electric furnace for treating gases." H. Pauling. February 8th. (Complete.)

3,258. "Controller for electric lifts and the like." Easton Lift Co., Ltd., and W. J. Huggett. February 8th.

3,261. "Petrol-electric transmission for vehicles and launches." W. A. Stevens. February 8th.

3,262. "Petrol-electric transmission for motor vehicles and launches." W. A. Stevens. February 8th.

3,268. "Vapour-electric devices." British Thomson-Houston Co., Ltd. (General Electric Co., United States.) February 8th. (Complete.)

3,272. "Electric insulators." Bullers, Ltd., and G. V. Twiss. February 8th. (Complete.)

3,286. "Magnetic separators." Heenan & Froude, Ltd., and W. Mortimore. February 9th.

3,288. "Electric conductors for vacuum apparatus and method and means of sealing same into quartz and the like." Brush Electrical Engineering Co., Ltd., and A. E. Salisbury. February 9th.

3,291. "Process for the manufacture of tungsten and the like metal-filaments for incandescent electric lamps." K. Reiter and Imperial Lamp Works (Brimsdown), Ltd. February 9th.

3,328. "Means for regulating and controlling the pressure in an electric circuit." T. Y. Baker and Adams, Watkin Co., Ltd. February 9th.

3,334. "Combine magneto-ignition gear for internal combustion engines and wireless telegraphy apparatus, particularly applicable to aerial vessels." M. F. Sueter, F. L. M. Boothby and H. G. Paterson. February 9th.

3,392. "Electric lantern for exterior illumination." F. C. McQuown. February 10th.

3,422. "Loaded phantom circuits." G. A. Campbell and T. Shaw. (Convention dated February 12th, 1910, United States.) February 10th. (Complete.)

3,423. "Phantomed loaded circuits." T. Shaw. (Convention dated February 12th, 1910, United States.) February 10th. (Complete.)

3,446. "Underground electric cable troughing." O. V. Thomas. February 10th.

3,450. "Prepayment electric meters." H. Aron Elektrizitats Zahler Fabrik G.m.b.H. (Convention date, April 6th, 1910, Germany.) February 10th. (Complete.)

3,452. "Automatic telephonic systems selectors." F. R. McBerty. (Convention date, February 10th, 1910, United States.) February 10th. (Complete.)

3,460. "Electric alarm clocks." R. P. Bartlow. February 11th.

3,495. "Electric lighting of motor-cars, railway vehicles and the like." I. H. Storey and J. Parkinson. February 11th.

3,514. "Electric bell pushes." L. Bonnet. February 11th.

3,524. "Intercommunicating telephone systems and apparatus." R. L. Murray. February 11th.

3,526. "Means for supporting electrical incandescent lamps or the like." G. A. Phillips and H. M. Phillips. February 11th. (Complete.)

3,541. "Electric incandescent lamps." E. G. Royer. (Convention date, February 12th, 1910, France.) February 11th. (Complete.)

PUBLISHED SPECIFICATIONS.

Copies of any of the Specifications in the following list may be obtained of Messrs. W. P. Thompson & Co., 285, High Holborn, W.C., and at Liverpool and Bradford; price, post free, 9d. (in stamps).

1909.

Automatic Electrically-Driven Pumps for Domestic Water Supply. M. Brandenburg. 29,383. December 15th.

1910.

Electric Furnaces. J. H. Reid. 1,189. January 17th.

Compensating Winding for Polyphase Commutator Machines with Drum Armatures. Akt.-Ges. Brown, Boveri et Cie. 1,768. January 24th. (June 18th, 1909.)

Sparking Plugs. A. Hosch and R. Morrell. 2,186. January 28th.

Cranes and Winches Operated by Electric Motors. Stothert & Pitt, L[illegible]., and W. Pitt. 3,462. February 12th.

Electric Arc Lamps. Siemens-Schuckertwerke Ges. 5,452. March 4th. (Convention, March 9th, 1909.)

Sockets of Incandescent Electric Lamps. C. G. M. Bennett. 5,926. March 9th.

Apparatus for the Electrodeposition of Metals. T. A. Smith and T. Deakin. 7,224. March 23rd.

Apparatus for Determining the Position of Faults in Electric Mains. R. A. D. Macalister. 7,574. March 29th.

Double-Break Electric Switches. Sykes & Sugden, Ltd., and A. Sugden. 8,460. April 8th.

Method of Controlling the Starting and Retarding of Induction Motors of the Slip-Ring or Equivalent Type. H. J. S. Heather. 9,304. April 16th.

Battery Connectors. E. J. Smith. 9,617. April 20th.

Systems for Controlling Electric Motors. E. C. R. Marks. (Felten and Guilleaume Lahmeyerwerke Akt.-Ges.) 10,370. April 27th.

Manufacture of Electric Metal-Filament Lamps. O. Krause. 11,107. May 5th. (May 6th, 1909.)

Electrical Accumulators. P. K. Stern. 11,781. May 12th. (May 12th, 1909.)

Selectors for Automatic Telephone Exchange Systems. W. P. Thompson. (Deutsche Telephonwerke Ges.) 12,248. May 18th.

Electric Arc Lamps for use with Searchlight Projectors. Siemens Bros. Dynamo Works and J. Nebel. 15,018. June 22nd.

Controller Regulators for Electric Motors. W. P. Thompson. (J. V. Porter.) 15,548. June 28th.

Manufacture of Electric Metal-Filament Lamps. K. Schroter. 15,879. July 2nd. (January 21st, 1910.)

Selenium Cell and like Signalling Systems and Apparatus therefor, especially applicable to Railway and like Signalling. Allgemeine Elektricitäts Ges. 17,156. July 19th. (July 19th, 1909.)

Electric Circuits for Railway Signals. Siemens Bros. & Co. (Siemens and Halske Akt.-Ges.) 20,926. August 31st.

Electric Furnaces. M. Ruthenburg. 20,401. September 1st.

Emergency Braking Devices. Allgemeine Elektricitäts Ges. 25,589. November 3rd. (November 3rd, 1909.)

Electrical Current Transformers. Siemens Bros. & Co. (Siemens and Halske Akt.-Ges.) 25,782. November 5th.

Device for Attaching Reflectors or Shades to Electric Lamp Holders. R. J. Eskrigge. 415. January 7th. (June 17th, 1910.)

Clutch for use in conjunction with the Driving of Dynamos in Vehicles and Rolling Stock. J. Polkey. 936. January 13th.

Electrical Incandescent Lamp Holders, Ceiling Roses, or like Articles to which Flexible Conductors are Connected. H. E. Evans. 1,164. January 17th.

Electromagnetic Relays and the like. O. D. Lucas. 1,167. January 17th.

Telephone Switch Apparatus. E. C. R. Marks. (Electro-Mechanical Works.) 1,281. January 18th.

Telephone Systems. S. G. S. Dicker. (Automatic Electric Co.) 1,298. January 18th.

Electric Clocks. T. J. Murday and Reason Mfg. Co. 1,326. January 18th.

Telephone Systems. E. A. Mellinger. 1,418. January 19th.

Telephone Systems. T. G. Martin. 1,419. January 19th.

Shade Carrier and Shade as applied to Electric Lamp-Holders. F. D. Dewse and R. C. Dewse. 1,465. January 20th.

Rotary Commutator for Obtaining Alternating-Current Impulses from a Direct-Current Source. A. Burns 1,475. January 20th.

Process to Regenerate and Improve the Structure of Lead Electrodes of Secondary Batteries. E. H. Naylor. 1,558. January 21st.

Telephone Receivers. Siemens Bros. & Co. and E. R. Riber. 1,698. January 21st.

Intercommunication Telephone Systems. Sterling Telephone and Electric Co. and F. G. Bell. 1,631. January 21st.

Method of Determining when a Secondary Battery has Received its Full Charge. A. N. Hazlehurst and Longstreths, Ltd. 1,677. January 22nd.

Automatic Telephone Exchanges for Double-Wire Telephone Systems. G. A. Betulander. 1,946. January 26th.

Mercury Breaks or Interrupters for Induction Coils and Transformer Apparatus. H. F. Bigge and F. R. Butt. 3,209. February 9th.

Dynamo-Electric Machines for Voltage Transformation. Siemens Bros. Dynamo Works and W. Parker. 4,262. February 21st.

Control of Electrically Operated Switches. H. E. White. 4,811. February 25th. (February 27th, 1909.)

Electric Bells. E. I. Parkes. 5,014. February 28th.

Current Collectors for Electric Railways or the like. A. H. Jackson and A. W. Furniss. 5,098. March 1st.

Ventilation of Dynamo-Electric Machines. Siemens Bros. Dynamo Works, E. S. Kieffer and M. Kloss. 5,118. March 1st.

Constant-Current Dynamos. A. Hill and Trier & Martin, Ltd. 5,652. March 7th.

Automatic Apparatus for Controlling Electric Circuits. H. Hirst and J. W. Record. 10,530. April 29th.

Automatic Electric Apparatus for Setting the Hands of a Clock or Clocks either Backwards or Forwards at will. S. D. Neill. 11,379. May 9th.

Electric Safety Lamp. P. L. Trin. 12,368. May 21st.

Cooling of Dynamo-Electric Machines. Allgemeine Elektricitäts Ges. 14,863. June 20th. (June 21st, 190[illegible]. Patent of Addition not granted.)

Central-Energy Electrical Signalling System. A. Goldstein and C. Pool. 16,334. July 8th.

Sparking Gaps for Producing High-Frequency Oscillations. S. Eisenstein. 16,371. July 8th.

Transmitter for Transmitting Telegrams Composed in Perforations on a Band by the Baudot System. J. Carpentier. 19,102. August 18th. (October 29th, 1909.)

Electro-Medical Electrode Holders. Siemens Bros. & Co. (Siemens and Halske Akt.-Ges.) 21,339. September 14th.

Sparking Plugs. E. Kuhn. 27,574. November 26th. (Divided application on No. 12,133 of 1910. May 17th.)

Telephone Receivers. S. G. S. Dicker. (Automatic Electric Co.) 29,182. December 15th. (Divided application on No. 1,298 of 1910. January 18th.)

The Standard Cell.—A circular letter has recently been issued by Dr. R. T. Glazebrook, Director of the National Physical Laboratory (dated January 1st), regarding the voltage of the Weston normal cell. As we explained in a recent issue, the International Committee has recommended that the value 1·0183 international volts at 20° C. be adopted as from January 1st, 1911. The N.P.L. certificates in 1909 and 1910 were based on the value 1·0184, and these certificates can therefore be corrected by subtracting one part in 10,000 from the value stated on the certificates.